THERMAL ARC

A THERMADYNE Company

Plasma Welding Power Supply

CE Ultima 150

Service Manual

Revision AE

Manual No. 0-2617

WARNINGS

Read and understand this entire Operating Manual and your employer's safety practices before installing, operating, or servicing the equipment.

While the information contained in this operators manual represents our best judgement, Thermal Dynamics Corporation assumes no liability for its use.

Plasma Welding Power Supply
CE ULTIMA-150
Service Manual Number 0-2617

Published by:
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Record the following information for Warranty purposes:

Where Purchased:_____

Purchase Date:_____

Power Supply Serial #:_____

Torch Serial #:_____

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SECTION 1: GENERAL INFORMATION

1.01 Notes, Cautions and Warnings

Throughout this manual, notes, cautions, and warnings are used to highlight important information. These highlights are categorized as follows:

NOTE

An operation, procedure, or background information which requires additional emphasis or is helpful in efficient operation of the system.

CAUTION

A procedure which, if not properly followed, may cause damage to the equipment.

WARNING

A procedure which, if not properly followed, may cause injury to the operator or others in the operating area.

1.02 Important Safety Precautions

WARNINGS

OPERATION AND MAINTENANCE OF PLASMA ARC EQUIPMENT CAN BE DANGEROUS AND HAZARDOUS TO YOUR HEALTH.

Plasma arc cutting produces intense electric and magnetic emissions that may interfere with the proper function of cardiac pacemakers, hearing aids, or other electronic health equipment. Persons who work near plasma arc cutting applications should consult their medical health professional and the manufacturer of the health equipment to determine whether a hazard exists.

To prevent possible injury, read, understand and follow all warnings, safety precautions and instructions before using the equipment. Call 1-603-298-5711 or your local distributor if you have any questions.

GASES AND FUMES

Gases and fumes produced during the plasma cutting process can be dangerous and hazardous to your health.

- Keep all fumes and gases from the breathing area. Keep your head out of the welding fume plume.
- Use an air-supplied respirator if ventilation is not adequate to remove all fumes and gases.
- The kinds of fumes and gases from the plasma arc depend on the kind of metal being used, coatings on the metal, and the different processes. You must be very careful when cutting or welding any metals which may contain one or more of the following:

Antimony	Chromium	Mercury
Arsenic	Cobalt	Nickel
Barium	Copper	Selenium
Beryllium	Lead	Silver
Cadmium	Manganese	Vanadium

- Always read the Material Safety Data Sheets (MSDS) that should be supplied with the material you are using. These MSDSs will give you the information regarding the kind and amount of fumes and gases that may be dangerous to your health.
- For information on how to test for fumes and gases in your workplace, refer to item 1 in Subsection 1.03, Publications in this manual.
- Use special equipment, such as water or down draft cutting tables, to capture fumes and gases.
- Do not use the plasma torch in an area where combustible or explosive gases or materials are located.
- Phosgene, a toxic gas, is generated from the vapors of chlorinated solvents and cleansers. Remove all sources of these vapors.
- This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Sec. 25249.5 et seq.)

ELECTRIC SHOCK

Electric Shock can injure or kill. The plasma arc process uses and produces high voltage electrical energy. This electric energy can cause severe or fatal shock to the operator or others in the workplace.

- Never touch any parts that are electrically "live" or "hot."

- Wear dry gloves and clothing. Insulate yourself from the work piece or other parts of the welding circuit.
- Repair or replace all worn or damaged parts.
- Extra care must be taken when the workplace is moist or damp.
- Install and maintain equipment according to NEC code, refer to item 9 in Subsection 1.03, Publications.
- Disconnect power source before performing any service or repairs.
- Read and follow all the instructions in the Operating Manual.

FIRE AND EXPLOSION

Fire and explosion can be caused by hot slag, sparks, or the plasma arc.

- Be sure there is no combustible or flammable material in the workplace. Any material that cannot be removed must be protected.
- Ventilate all flammable or explosive vapors from the workplace.
- Do not cut or weld on containers that may have held combustibles.
- Provide a fire watch when working in an area where fire hazards may exist.
- Hydrogen gas may be formed and trapped under aluminum workpieces when they are cut underwater or while using a water table. **DO NOT** cut aluminum alloys underwater or on a water table unless the hydrogen gas can be eliminated or dissipated. Trapped hydrogen gas that is ignited will cause an explosion.

NOISE

Noise can cause permanent hearing loss. Plasma arc processes can cause noise levels to exceed safe limits. You must protect your ears from loud noise to prevent permanent loss of hearing.

- To protect your hearing from loud noise, wear protective ear plugs and/or ear muffs. Protect others in the workplace.
- Noise levels should be measured to be sure the decibels (sound) do not exceed safe levels.
- For information on how to test for noise, see item 1 in Subsection 1.03, Publications, in this manual.

PLASMA ARC RAYS

Plasma Arc Rays can injure your eyes and burn your skin. The plasma arc process produces very bright ultra violet and infra red light. These arc rays will damage your eyes and burn your skin if you are not properly protected.

- To protect your eyes, always wear a welding helmet or shield. Also always wear safety glasses with side shields, goggles or other protective eye wear.
- Wear welding gloves and suitable clothing to protect your skin from the arc rays and sparks.
- Keep helmet and safety glasses in good condition. Replace lenses when cracked, chipped or dirty.
- Protect others in the work area from the arc rays. Use protective booths, screens or shields.
- Use the shade of lens as suggested in the following per ANSI/ASC Z49.1:

Arc Current	Minimum Protective Shade No.	Suggested Shade No.
Less Than 300*	8	9
300 - 400*	9	12
400 - 800*	10	14

** These values apply where the actual arc is clearly seen. Experience has shown that lighter filters may be used when the arc is hidden by the workpiece.*

1.03 Publications

Refer to the following standards or their latest revisions for more information:

1. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126
3. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING, obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY-TOE FOOTWEAR, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018

6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING AND ALLIED PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

9. NFPA Standard 70, NATIONAL ELECTRICAL CODE, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202

12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING, obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3

13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103

14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, NY 10018

1.04 Note, Attention et Avertissement

Dans ce manuel, les mots “note,” “attention,” et “avertissement” sont utilisés pour mettre en relief des informations à caractère important. Ces mises en relief sont classifiées comme suit :

NOTE

Toute opération, procédure ou renseignement général sur lequel il importe d’insister davantage ou qui contribue à l’efficacité de fonctionnement du système.

ATTENTION

Toute procédure pouvant résulter l’endommagement du matériel en cas de non-respect de la procédure en question.

AVERTISSEMENT

Toute procédure pouvant provoquer des blessures de l’opérateur ou des autres personnes se trouvant dans la zone de travail en cas de non-respect de la procédure en question.

1.05 Precautions De Securite Importantes

AVERTISSEMENTS

L’OPÉRATION ET LA MAINTENANCE DU MATÉRIEL DE SOUDAGE À L’ARC AU JET DE PLASMA PEUVENT PRÉSENTER DES RISQUES ET DES DANGERS DE SANTÉ.

Coupant à l’arc au jet de plasma produit de l’énergie électrique haute tension et des émissions magnétique qui peuvent interférer la fonction propre d’un “pacemaker” cardiaque, les appareils auditif, ou autre matériel de santé electronique. Ceux qui travail près d’une application à l’arc au jet de plasma devrait consulter leur membre professionel de médication et le manufacturier de matériel de santé pour déterminer s’il existe des risques de santé.

Il faut communiquer aux opérateurs et au personnel TOUS les dangers possibles. Afin d’éviter les blessures possibles, lisez, comprenez et suivez tous les avertissements, toutes les précautions de sécurité et toutes les consignes avant d’utiliser le matériel. Composez le + 603-298-5711 ou votre distributeur local si vous avez des questions.

FUMÉE et GAZ

La fumée et les gaz produits par le procédé de jet de plasma peuvent présenter des risques et des dangers de santé.

- Eloignez toute fumée et gaz de votre zone de respiration. Gardez votre tête hors de la plume de fumée provenant du chalumeau.
- Utilisez un appareil respiratoire à alimentation en air si l'aération fournie ne permet pas d'éliminer la fumée et les gaz.
- Les sortes de gaz et de fumée provenant de l'arc de plasma dépendent du genre de métal utilisé, des revêtements se trouvant sur le métal et des différents procédés. Vous devez prendre soin lorsque vous coupez ou soudez tout métal pouvant contenir un ou plusieurs des éléments suivants:

antimoine	cadmium	mercure
argent	chrome	nickel
arsenic	cobalt	plomb
baryum	cuivre	sélénium
béryllium	manganèse	vanadium

- Lisez toujours les fiches de données sur la sécurité des matières (sigle américain "MSDS"); celles-ci devraient être fournies avec le matériel que vous utilisez. Les MSDS contiennent des renseignements quant à la quantité et la nature de la fumée et des gaz pouvant poser des dangers de santé.
- Pour des informations sur la manière de tester la fumée et les gaz de votre lieu de travail, consultez l'article 1 et les documents cités à la page 5.
- Utilisez un équipement spécial tel que des tables de coupe à débit d'eau ou à courant descendant pour capter la fumée et les gaz.
- N'utilisez pas le chalumeau au jet de plasma dans une zone où se trouvent des matières ou des gaz combustibles ou explosifs.
- Le phosgène, un gaz toxique, est généré par la fumée provenant des solvants et des produits de nettoyage chlorés. Eliminez toute source de telle fumée.
- Ce produit, dans le procéder de soudage et de coupe, produit de la fumée ou des gaz pouvant contenir des éléments reconnu dans L'état de la Californie, qui peuvent causer des défauts de naissance et le cancer. (La sécurité de santé en Californie et la code sécurité Sec. 25249.5 et seq.)

CHOC ELECTRIQUE

Les chocs électriques peuvent blesser ou même tuer. Le procédé au jet de plasma requiert et produit de l'énergie électrique haute tension. Cette énergie électrique peut produire des chocs graves, voire mortels, pour l'opérateur et les autres personnes sur le lieu de travail.

- Ne touchez jamais une pièce "sous tension" ou "vive"; portez des gants et des vêtements secs. Isolez-vous de la pièce de travail ou des autres parties du circuit de soudage.
- Réparez ou remplacez toute pièce usée ou endommagée.
- Prenez des soins particuliers lorsque la zone de travail est humide ou moite.
- Montez et maintenez le matériel conformément au Code électrique national des Etats-Unis. (Voir la page 5, article 9.)
- Débranchez l'alimentation électrique avant tout travail d'entretien ou de réparation.
- Lisez et respectez toutes les consignes du Manuel de consignes.

INCENDIE ET EXPLOSION

Les incendies et les explosions peuvent résulter des scories chaudes, des étincelles ou de l'arc de plasma. Le procédé à l'arc de plasma produit du métal, des étincelles, des scories chaudes pouvant mettre le feu aux matières combustibles ou provoquer l'explosion de fumées inflammables.

- Soyez certain qu'aucune matière combustible ou inflammable ne se trouve sur le lieu de travail. Protégez toute telle matière qu'il est impossible de retirer de la zone de travail.
- Procurez une bonne aération de toutes les fumées inflammables ou explosives.
- Ne coupez pas et ne soudez pas les conteneurs ayant pu renfermer des matières combustibles.
- Prévoyez une veille d'incendie lors de tout travail dans une zone présentant des dangers d'incendie.
- Le gas hydrogène peut se former ou s'accumuler sous les pièces de travail en aluminium lorsqu'elles sont coupées sous l'eau ou sur une table d'eau. NE PAS couper les alliages en aluminium sous l'eau ou sur une table d'eau à moins que le gas hydrogène peut s'échapper ou se dissiper. Le gas hydrogène accumulé explosera si enflammé.

RAYONS D'ARC DE PLASMA

Les rayons provenant de l'arc de plasma peuvent blesser vos yeux et brûler votre peau. Le procédé à l'arc de plasma produit une lumière infra-rouge et des rayons

ultra-violets très forts. Ces rayons d'arc nuiront à vos yeux et brûleront votre peau si vous ne vous protégez pas correctement.

- Pour protéger vos yeux, portez toujours un casque ou un écran de soudeur. Portez toujours des lunettes de sécurité munies de parois latérales ou des lunettes de protection ou une autre sorte de protection oculaire.
- Portez des gants de soudeur et un vêtement protecteur approprié pour protéger votre peau contre les étincelles et les rayons de l'arc.
- Maintenez votre casque et vos lunettes de protection en bon état. Remplacez toute lentille sale ou comportant fissure ou rognure.
- Protégez les autres personnes se trouvant sur la zone de travail contre les rayons de l'arc en fournissant des cabines ou des écrans de protection.
- Utilisez la nuance de lentille qui est suggèrée dans le recommendation qui suivent ANSI/ASC Z49.1:

Courant Arc	Nuance Minimum Protective Numéro	Nuance Suggerée Numéro
Moins de 300*	8	9
300 - 400*	9	12
400 - 800*	10	14

** Ces valeurs s'appliquent ou l'arc actuel est observé clairement. L'experience a démontrer que les filtres moins foncés peuvent être utilisés quand l'arc est caché par moiceau de travail.*

BRUIT

Le bruit peut provoquer une perte permanente de l'ouïe. Les procédés de soudage à l'arc de plasma peuvent provoquer des niveaux sonores supérieurs aux limites normalement acceptables. Vous dú4ez vous protéger les oreilles contre les bruits forts afin d'éviter une perte permanente de l'ouïe.

- Pour protéger votre ouïe contre les bruits forts, portez des tampons protecteurs et/ou des protections auriculaires. Protégez également les autres personnes se trouvant sur le lieu de travail.
- Il faut mesurer les niveaux sonores afin d'assurer que les décibels (le bruit) ne dépassent pas les niveaux sûrs.
- Pour des renseignements sur la manière de tester le bruit, consultez l'article 1, page 5.

1.06 Documents De Reference

Consultez les normes suivantes ou les révisions les plus récentes ayant été faites à celles-ci pour de plus amples renseignements :

1. OSHA, NORMES DE SÉCURITÉ DU TRAVAIL ET DE PROTECTION DE LA SANTÉ, 29CFR 1910, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
2. Norme ANSI Z49.1, LA SÉCURITÉ DES OPÉRATIONS DE COUPE ET DE SOUDAGE, disponible auprès de la Société Américaine de Soudage (American Welding Society), 550 N.W. LeJeune Rd., Miami, FL 33126
3. NIOSH, LA SÉCURITÉ ET LA SANTÉ LORS DES OPÉRATIONS DE COUPE ET DE SOUDAGE À L'ARC ET AU GAZ, disponible auprès du Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
4. Norme ANSI Z87.1, PRATIQUES SURES POUR LA PROTECTION DES YEUX ET DU VISAGE AU TRAVAIL ET DANS LES ECOLES, disponible de l'Institut Américain des Normes Nationales (American National Standards Institute), 1430 Broadway, New York, NY 10018
5. Norme ANSI Z41.1, NORMES POUR LES CHAUSSURES PROTECTRICES, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
6. Norme ANSI Z49.2, PRÉVENTION DES INCENDIES LORS DE L'EMPLOI DE PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018
7. Norme A6.0 de l'Association Américaine du Soudage (AWS), LE SOUDAGE ET LA COUPE DE CONTENEURS AYANT RENFERMÉ DES PRODUITS COMBUSTIBLES, disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126
8. Norme 51 de l'Association Américaine pour la Protection contre les Incendies (NFPA), LES SYSTEMES À GAZ AVEC ALIMENTATION EN OXYGENE POUR LE SOUDAGE, LA COUPE ET LES PROCÉDÉS ASSOCIÉS, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

9. Norme 70 de la NFPA, CODE ELECTRIQUE NATIONAL, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

10. Norme 51B de la NFPA, LES PROCÉDÉS DE COUPE ET DE SOUDAGE, disponible auprès de la National Fire Protection Association, Batterymarch Park, Quincy, MA 02269

11. Brochure GCA P-1, LA MANIPULATION SANS RISQUE DES GAZ COMPRIMÉS EN CYLINDRES, disponible auprès de l'Association des Gaz Comprimés (Compressed Gas Association), 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202

12. Norme CSA W117.2, CODE DE SÉCURITÉ POUR LE SOUDAGE ET LA COUPE, disponible auprès de l'Association des Normes Canadiennes, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada, M9W 1R3

13. Livret NWSA, BIBLIOGRAPHIE SUR LA SÉCURITÉ DU SOUDAGE, disponible auprès de l'Association Nationale de Fournitures de Soudage (National Welding Supply Association), 1900 Arch Street, Philadelphia, PA 19103

14. Norme AWSF4.1 de l'Association Américaine de Soudage, RECOMMANDATIONS DE PRATIQUES SURES POUR LA PRÉPARATION À LA COUPE ET AU SOUDAGE DE CONTENEURS ET TUYAUX AYANT RENFERMÉ DES PRODUITS DANGEREUX , disponible auprès de la American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126

15. Norme ANSI Z88.2, PRATIQUES DE PROTECTION RESPIRATOIRE, disponible auprès de l'American National Standards Institute, 1430 Broadway, New York, NY 10018

1.07 Declaration of Conformity

Manufacturer: Thermal Dynamics Corporation
Address: 82 Benning Street
West Lebanon, New Hampshire 03784
USA

The equipment described in this manual conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (European Council Directive 73/23/EEC as amended by Council Directive 93/68/EEC) and to the National legislation for the enforcement of this Directive.

The equipment described in this manual conforms to all applicable aspects and regulations of the "EMC Directive" (European Council Directive 89/336/EEC) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

* CSA (Canadian Standards Association) standard C22.2 number 60 for Arc welding equipment.

* UL (Underwriters Laboratory) rating 94VO flammability testing for all printed-circuit boards used.

* CENELEC EN50199 EMC Product Standard for Arc Welding Equipment.

* ISO/IEC 60974-1 (BS 638-PT10) (EN 60 974-1) (EN50192) (EN50078) applicable to plasma cutting equipment and associated accessories.

* For environments with increased hazard of electrical shock, Power Supplies bearing the S mark conform to EN50192 when used in conjunction with hand torches with properly installed standoff guides.

* Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Thermal Dynamics has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative: Giorgio Bassi
Managing Director
Thermal Dynamics Europe
Via rio Fabbiani 8A
40067 Rastignano (BO)
Italy

CE

1.08 Statement of Warranty

LIMITED WARRANTY: Thermal Dynamics® Corporation (hereinafter "Thermal") warrants that its products will be free of defects in workmanship or material. Should any failure to conform to this warranty appear within the time period applicable to the Thermal products as stated below, Thermal shall, upon notification thereof and substantiation that the product has been stored, installed, operated, and maintained in accordance with Thermal's specifications, instructions, recommendations and recognized standard industry practice, and not subject to misuse, repair, neglect, alteration, or accident, correct such defects by suitable repair or replacement, at Thermal's sole option, of any components or parts of the product determined by Thermal to be defective.

THIS WARRANTY IS EXCLUSIVE AND IS IN LIEU OF ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

LIMITATION OF LIABILITY: Thermal shall not under any circumstances be liable for special or consequential damages, such as, but not limited to, damage or loss of purchased or replacement goods, or claims of customers of distributor (hereinafter "Purchaser") for service interruption. The remedies of the Purchaser set forth herein are exclusive and the liability of Thermal with respect to any contract, or anything done in connection therewith such as the performance or breach thereof, or from the manufacture, sale, delivery, resale, or use of any goods covered by or furnished by Thermal whether arising out of contract, negligence, strict tort, or under any warranty, or otherwise, shall not, except as expressly provided herein, exceed the price of the goods upon which such liability is based.

THIS WARRANTY BECOMES INVALID IF REPLACEMENT PARTS OR ACCESSORIES ARE USED WHICH MAY IMPAIR THE SAFETY OR PERFORMANCE OF ANY THERMAL PRODUCT.

THIS WARRANTY IS INVALID IF THE PRODUCT IS SOLD BY NON-AUTHORIZED PERSONS.

The limited warranty periods for Thermal products shall be as follows (with the exception of XL Plus Series, CutMaster Series , Cougar and DRAG-GUN): A maximum of three (3) years from date of sale to an authorized distributor and a maximum of two (2) years from date of sale by such distributor to the Purchaser, and with the further limitations on such two (2) year period (see chart below).

The limited warranty period for XL Plus Series and CutMaster Series shall be as follows: A maximum of four (4) years from date of sale to an authorized distributor and a maximum of three (3) years from date of sale by such distributor to the Purchaser, and with the further limitations on such three (3) year period (see chart below).

The limited warranty period for Cougar and DRAG-GUN shall be as follows: A maximum of two (2) years from date of sale to an authorized distributor and a maximum of one (1) year from date of sale by such distributor to the Purchaser, and with the further limitations on such two (2) year period (see chart below).

	Parts			
PAK Units, Power Supplies	**XL Plus & CutMaster Series**	**Parts Cougar/Drag-Gun**	**Parts All Others**	**Labor**
Main Power Magnetics	3 Years	1 Year	2 Years	1 Year
Original Main Power Rectifier	3 Years	1 Year	2 Years	1 Year
Control PC Board	3 Years	1 Year	2 Years	1 Year
All Other Circuits And Components Including, But Not Limited To, Starting Circuit, Contactors, Relays, Solenoids, Pumps, Power Switching Semi-Conductors	1 Year	1 Year	1 Year	1 Year
Consoles, Control Equipment, Heat Exchanges, And Accessory Equipment	1 Year		1 Year	1 Year
Torch And Leads				
Maximizer 300 Torch			1 Year	1 Year
SureLok Torches	1 Year		1 Year	1 Year
All Other Torches	180 Days	180 Days	180 Days	180 Days
Repair/Replacement Parts	90 Days	90 Days	90 Days	None

Warranty repairs or replacement claims under this limited warranty must be submitted by an authorized Thermal Dynamics® repair facility within thirty (30) days of the repair. No transportation costs of any kind will be paid under this warranty. Transportation charges to send products to an authorized warranty repair facility shall be the responsibility of the customer. All returned goods shall be at the customer's risk and expense. This warranty supersedes all previous Thermal warranties.

Effective: November 15, 2001

SECTION 2: INTRODUCTION

2.01 Scope of Manual

This manual provides service instructions for the Thermal Arc® ULTIMA-150® Plasma Welding EMC Power Supply. Information in this edition is particularly applicable to the troubleshooting and repair of the equipment. For information on operating procedures, please refer to the ULTIMA-150 Plasma Welding EMC Power Supply Operating Manual (0-2530).

NOTE

Service of this equipment is restricted to properly trained service technicians familiar with this equipment; unqualified personnel are strictly cautioned against attempting repairs or adjustments not covered in this manual, at the risk of voiding the warranty.

Read both this manual and the Operating Manual thoroughly. A complete understanding of the capabilities and functions of the equipment will assure obtaining the performance for which it was designed.

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in high power electronics measurement and troubleshooting.

2.02 General Service Philosophy

Several key points are essential to properly support the application and operation of this equipment.

A. Application

Confirm that the equipment is capable of handling the application desired. Specifications supplied and described in Subsection 2.05 of this manual.

B. Modifications

No physical or electrical modifications other than selection of standard options and accessories are to be made to this equipment.

C. Customer/Operator Responsibilities

It is the customer/operator's responsibility to maintain the equipment and peripheral accessories provided by Thermal Arc in good operating order in accordance with the procedures outlined in the Operating Manual, and to protect the equipment from accidental or malicious damage.

D. Repair Restrictions

The electronics consists of printed circuit board assemblies which must be carefully handled, and must be replaced as units. No replacement of printed circuit solder-mounted components is allowed except as noted in this manual.

If the Printed Circuit Board is to be returned, the replaced Printed Circuit Board Assemblies must be properly packaged in protective material and returned intact per normal procedures.

2.03 Service Responsibilities

The Service Technician should be familiar with the equipment and its capabilities and should be prepared to recommend arrangements of components which will provide the most efficient layout, utilizing the equipment to its best possible advantage.

Maintenance work should be accomplished in a timely manner. If problems are encountered, or the equipment does not function as specified, contact the Technical Service Department in West Lebanon, NH for assistance.

2.04 ULTIMA-150 EMC Power Supply Description

The ULTIMA-150 Plasma Welding EMC Power Supply is one integrated unit providing power, pilot control inverter, and coolant recirculator. The power supply has output ranges from 0.5-15 amps and 5-150 amps. It is ideally suited for all automated welding applications as well as all low current gas tungsten arc welding (GTAW) applications. The ULTIMA-150 EMC Power Supply is suitable for use with all designated Thermal Arc plasma welding torches.

2.05 ULTIMA-150 EMC Power Supply Specifications

A. Input Power

380 vac ±10%	50/60hz, 1 or 3 phase
415 vac ±10%	50/60hz, 1 or 3 phase

B. Output Power

1. Output Amps

Range I - 0.5 to 15 amps DC straight polarity
Range II - 5 to 150 amps DC straight polarity

2. Duty Cycle

60% Duty Cycle @ 40°C, 150 amp output
100% Duty Cycle @ 40°C, 100 amp output

3. Pilot Arc Output

2-15 amp variable, continuous pilot arc
Pilot arc output 100% duty cycle @ 40° C

C. Fuse

3A, 500V (1FU) Fuse

D. Protection Features

A number of interlocks have been to provided to assure proper handling of fault conditions at all times.

- Coolant flow and level - monitored and shut down the recirculator pump when below minimum levels.
- Pump operation - system shuts down due to air in torch leads or in the system.
- Coolant and power supply - overtemperature of the power supply or coolant will immediately disable the power supply output. The recirculator pump remains running for system and coolant cool down.
- Plasma gas and shield gas - both have minimum pressure switches that disable pilot arc operation.
- Pilot arc - always latched off in event of power supply interlock trip. The pilot must be disabled and then reenergized to initiate the pilot arc after a fault shutdown.

E. Gas Supply

- Plasma Gas - 0.5-3.0 scfh (.25-1.8 lpm) @ 35 psi
- Shield Gas - 5.0-30 scfh (2.5-15 lpm) @ 35 psi

F Coolant Reservoir Capacity

2 gal. (7.6 liters) Coolant Reservoir (use Thermal Arc Coolant only)

G. Weight

130 lbs (59 kg) - unit only (coolant or torch not included)

150 lbs (68 kg) - shipping

H. Dimensions

18" (.46 m) high x 15" (.38 m) wide x 29" (.74 m) deep

2.06 The ULTIMA-150 System

The ULTIMA-150 Plasma Welding System includes the following components:

- ULTIMA-150 EMC Power Supply with 2 Gas Supply Hoses
- Quick Disconnect Torch with leads (torch type and lead length as ordered)
- Torch Spare Parts Kit
- 2 gallons (7.6 liters) Thermal Arc Coolant
- 10 ft (304.8 cm) Work Cable with Cable Lug Connector

Figure 2-1 The ULTIMA-150 System

2.07 Requirements to Complete System

To complete the system, the user needs the following:

- Remote signal to operate Arc ON/OFF via TB-1 interface or J-20 receptacle using accessory remote device
- Gas Pressure Regulators. Both Argon Gas Regulator and Argon/Hydrogen Gas Regulators are available through Thermal Arc
- Power Input Cable

2.08 Options, Accessories and Replacement Parts

Options and accessories are available for the ULTIMA-150 Plasma Welding EMC Power Supply to customize it for a particular application or to further enhance performance. For more information, refer to Section 5, Parts Replacement.

- Quick Disconnect Adapter Kit - for use with older model Thermal Arc torches. The Adapter Kit retrofits the torch for direct connection to the quick disconnect receptacle on the Power Supply.
- Torch Spare Parts Kit - contains replacement front end torch parts.
- Remote Current Control Device - required for operation of the ULTIMA-150 Plasma Welding System.
- Weld Sequencer - an add-on accessory for controlling weld timing, pulsing, current slope, and gas slope.
- Coolant Pressure Gauge Assembly Kit - This kit allows for easy monitoring and adjusting of coolant pressure.

SECTION 3: SERVICE TROUBLESHOOTING

3.01 Introduction

This section provides service diagnostics for the ULTIMA-150 Plasma Welding EMC Power Supply allowing the technician to isolate any faulty subassemblies.

Under no circumstances are field repairs to be attempted on subassemblies (including printed circuit boards) of this unit. Evidence of unauthorized repairs will void the factory warranty.

NOTE

The troubleshooting contained in this manual is for the ULTIMA-150 EMC Power Supply only. Troubleshooting other parts of the system is covered in the separate manuals for that product.

Refer to Section 4 Repairs & Replacement, for parts replacement instructions.

3.02 Periodic Inspection

These inspection procedures should be performed at periodic intervals as required:

A. Physical Inspection

Before beginning troubleshooting, visually inspect the internal components for signs of overheating, fractures and damage. Check that all cable connections are secure.

B. Cleaning

The only routine maintenance required for the power supply is a thorough cleaning and inspection, with the frequency depending on the usage and the operating environment. Refer to the appropriate torch manual for information on torch maintenance.

3.03 Troubleshooting Information

A. Basic Troubleshooting

The ULTIMA-150 Plasma Welding Power Supply Operating Manual (No. 0-2530) provides information on basic troubleshooting and parts replacement procedures. This manual should be your first resource for troubleshooting; if the problem cannot be remedied using the Operating Manual, refer to the advanced troubleshooting in this Service Manual.

B. Advanced Troubleshooting

The ULTIMA-150 Plasma Welding EMC Power Supply Service Manual (No. 0-2617) provides advanced troubleshooting. This manual is helpful for solving many of the more complex problems that can arise with the Power Supply. Troubleshooting and repairing this unit is a process which should be undertaken only by those familiar with high voltage, high power electronic equipment.

The advanced troubleshooting covered in this service manual does require disassembly and live measurements of the power supply. If major complex assemblies are faulty, the unit must be returned to an authorized service center for repair.

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have had training in high power electronics measurement and troubleshooting.

WARNING

Never use a rubber hose to supply gas to system; moisture can impregnate rubber and damage the torch parts and torch head.

The Gas pipeline should always be pressurized, otherwise the collection of moisture can result, causing severe torch parts damage.

Disconnect primary power to the system before disassembling the unit.

NOTES

Many signals are transferred between Printed Circuit Board Assemblies on Ribbon Cables. If these cables become faulty they can then cause various problems. ***Do not*** *forget about these cables when troubleshooting.*

3.04 How to Troubleshoot the Ultima-150 EMC Power Supply

The Ultima-150 Plasma Welding EMC Power Supply is relatively simple to troubleshoot since it has a panel of indicator lights that continually provide feedback to the user. Under normal conditions, all *active* indicator lights are green. Blinking lights, red lights, and off lights are indicators of problems.

Should any light indicate a problem, refer to the appropriate troubleshooting section for that light. If more than one light is faulty, complete testing procedures in the order presented in this guide. Each subsection of this guide is set up as follows:

X. Symptom (bold type)

1. Cause (Italic Type)

a. Check/Remedy (Text Type)

Once a problem has been corrected, repeat the steps in Section 3.06 Basic Functions, to ensure that the complete problem has been remedied and that the power supply functions properly.

Troubleshooting the power supply has been organized as follows:

Section 3.06 - Checking Basic Functions

Section 3.07 - AC Power Problems

Section 3.08 - Temperature Problems

Section 3.09 - Gas Problems

Section 3.10 - Coolant Problems

Section 3.11 - PILOT Problems

Section 3.12 - DC Power Problems

Section 3.13 - A/V Display Status Problems

Section 3.14 - Static Test Procedures

3.05 Preparing to Troubleshoot

Before beginning to troubleshoot, connect the following:

1. Connect incoming voltage.
2. Connect torch with correct torch parts installed. (Consult appropriate torch manual for details, if required.)
3. Turn on Plasma and Shield gas supplies. Set both pressure regulators to provide 35 psi.
4. Install optional remote or contact closure switch between TB1 terminals 3 and 4 (Weld Arc On). Closing this switch turns weld arc on.

3.06 Checking Basic Functions

The following routine checks the basic functions of the Ultima-150 EMC Power Supply. Use this routine to verify that the system is working correctly. Should any light fail to display as described, refer to the appropriate troubleshooting section for that light and follow the instructions provided.

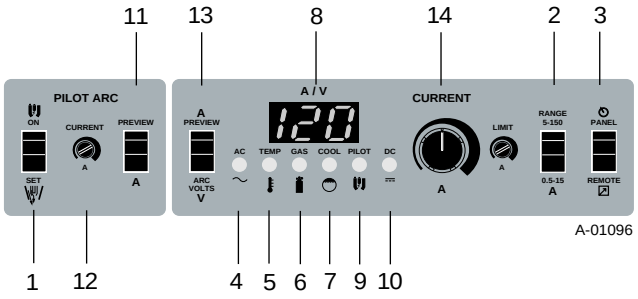


Figure 3-1 Indicator Lights Panel

1. Make sure Primary Power ON/OFF Switch is in OFF position.
2. Set Pilot Arc ON/SET switch (1) to SET.
3. Set RANGE switch (2) to 5-150.
4. Set PANEL/REMOTE switch (3) to PANEL.
5. Place Primary Power ON/OFF Switch to the ON position. Adjust Plasma and Shield Gas Flow meters on the front of unit to desired flow rate. Indicator lights should be:

Indicator Light	Display
AC (4)	on (green)
TEMP (5)	on (green)
GAS (6)	on
COOLANT (7)	on (green)
AV Display (8)	on (00)
PILOT (9)	off
DC (10)	off

6. Press the Pilot Arc Current PREVIEW Switch (11) to display the pilot arc's current set point. It is factory set for 7 amps. Consult the torch manual for other settings. To adjust the current set point, turn the Pilot Arc CURRENT potentiometer (12) clockwise to increase.

7. Press the Weld Current PREVIEW A Switch (13) to display the weld current set point. To adjust the current setting value, turn the CURRENT potentiometer (14) clockwise to increase.

8. Set Pilot Arc ON/SET Switch (1) to ON to initiate a pilot arc. Indicator lights should be:

Indicator Light	Display
AC (4)	on (green)
TEMP (5)	on (green)
GAS (6)	on (green)
COOLANT (7)	on (green)
AV Display (8)	on (00)
PILOT (9)	on
DC (10)	off

NOTE

Consult the appropriate torch manual for proper setting details.

9. With the tip of the torch within 1/4" of the workpiece. Start the welding arc. Welding arc will transfer. Indicator lights should be:

Indicator Light	Display
AC (4)	on (green)
TEMP (5)	on (green)
GAS (6)	on (green)
COOLANT (7)	on (green)
AV Display (8)	on (00)
PILOT (9)	on
DC (10)	on

NOTE

TB1-3 to TB1-4 must be closed to enable the welding arc. Refer to the Ultima-150 EMC Operating Manual for more information.

3.07 AC Indicator Light Status

Under normal operating conditions, the AC Indicator light is green.

Complete the following before attempting any service:

- Disconnect primary power and then place in the Primary Power ON/OFF Switch in the OFF position.
- Unplug J3 from Logic PC Board to disable DC output circuit.
- Connect primary power and then place the Primary Power ON/OFF Switch in the ON position.

A. No AC Light; Fan Doesn't Operate; Dim AC Light; All Lights are OFF; No A/V Display; Fan Operates Slow

1. Incorrect Input Power Connection

a. Check for one of the following at the top of the primary power ON/OFF switch. Correct input power connection, if necessary:

- L1 and L2 for single-phase.
- L1 and L2 and L3 for three-phase.

NOTE

See the Operating Manual for information on proper input connections.

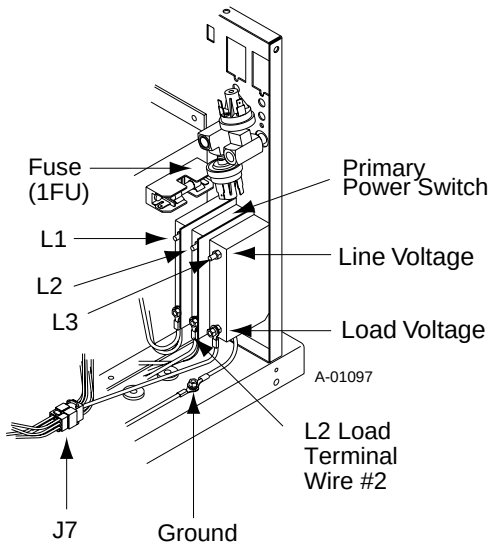


Figure 3-2 Input Connections

2. *Faulty Primary ON/OFF Switch*

   a. Measure AC input voltage at primary power ON/OFF switch line and load terminals. Compare top readings with bottom readings. Measure voltages on the required terminals per one of the following:

      - L1 and L2 for single-phase
      - L1 and L2 and L3 for three-phase

      If voltage is not present or low, disconnect the primary power, place the Primary Power ON/OFF Switch in the OFF position, then replace Switch.

3. *Faulty Fuse*

   a. Check the internal fuse if voltage is not present.

      If fuse needs to be replaced, disconnect the primary power, place the Primary ON/OFF Switch in the OFF position and replace internal fuse (1FU).

5. *Faulty Transformer*

   a. Check J7 connection at Transformer (located in front of the Output PC Board) for proper connection.

   b. Measure the output voltages at J4 on the Transformer (at Logic PC Board) for the following:

Pins	Voltage Level
1 to 2	18-25 VAC
2 to 3	18-25 VAC

      If voltage is not present, disconnect the primary power, place the Primary Power ON/OFF Switch in the OFF position and replace Transformer.

6. *Defective Logic PC Board*

   a. Check Logic PC Board at TP3 to TP1 (ground). Voltage should be 18-25 VDC.

      If voltage is not present, disconnect the primary power, place the Primary Power ON/OFF Switch in the OFF position and replace the Logic PC Board.

Once the problem has been identified and corrected, make sure the primary power is disconnect and the Primary Power ON/OFF Switch is in the OFF position then reconnect J3 to Logic PC Board to enable DC output circuit. Repeat steps in Section 3.06, Basic Functions to ensure the system is fully functional.

3.08 Temperature Indicator Light Status

Under normal operating conditions, the TEMP Indicator light is green.

Complete the following before attempting service:

- Disconnect the primary power and place the Primary ON/OFF Switch in the OFF position.
- Unplug J3 from Logic PC Board to disable DC output circuit.
- Connect the primary power and place the Primary Power ON/OFF Switch in the ON position.

A. TEMP light not on or TEMP light red.

1. *Obstructed air flow through unit.*

   a. Check for air obstruction within unit. Blow out radiator fins if necessary.

2. *Exceeded Duty Cycle*

   a. Exceeding duty cycle will cause the power supply or coolant to overheat. Allow 5 minutes to cool the unit with fan/pump running.

3. *Faulty Temperature Switch (es)*

   a. Check at the Logic PC Board for a normally open condition of +10 to 15 VDC from J5-8 to J5-7 (ground).

      If voltage level is correct, disconnect the primary power, place the Primary Power ON/OFF Switch to the OFF position, and replace the Logic PC Board.

      If voltage is incorrect (or approx. 0 volts) proceed to step (b) and check the Coolant Temperature Switch.

   b. Disconnect the primary power, place the Primary Power ON/OFF Switch in the OFF position, and remove J5 from the Logic PC Board and J12 from the Output PC Board.

      Check continuity of Coolant Temperature Switch between J5-7 and J5-8. Connection should be open (no continuity).

      If connection is not open (shorted), replace Coolant Temperature Switch Assembly. Reconnect J5.

      If open, reconnect J12 and proceed to step (c) and check the Output Heatsink Temperature Switch.

c. Check the continuity of Output Heatsink Temperature Switch between J12-1 and J12-2 (ground). Connection should be open (no continuity).

If connection is not open (shorted), replace Output Heatsink Temperature Switch Assembly.

If connection is open, proceed to step (d) and check the FET Heatsink Assembly (A) Temperature Switch.

d. Check continuity of FET Heatsink Assembly (A) Temperature Switch between J2A-10 to J2A-9 (ground) on ribbon cable located at the Logic PC Board. Connection should be open (no continuity).

If connection is not open, replace FET Assembly (A).

If connection is open, reconnect J2A to the Logic PC Board and proceed to step (e).

e. Check continuity of FET Heatsink Assembly (B) Temperature Switch between J2B-10 to J2B-9 (ground) at the Logic PC Board. Connection should be open (no continuity).

If not open, replace FET Heatsink Assembly (B) Temperature Switch.

If open, replace Logic PC Board.

Once the problem has been identified and corrected, make sure the primary power is disconnected and the Primary Power ON/OFF Switch is in the OFF position then reconnect J3 to Logic PC Board to enable DC output circuit. Repeat steps in Section 3.06 Basic Functions to ensure the system is fully functional.

3.09 Gas Indicator Light Status

Under normal conditions, the GAS Indicator Light is green when both the Plasma and Shield Gas Pressure Switches are satisfied.

NOTE

Plasma Gas is always on when input power is applied to unit. Shield gas is factory-set to flow when pilot arc is on (TB1 pins 17 and 18 connection is open). If user connects TB1 pins 17 and 18, Shield Gas flows constantly when AC power is applied to unit.

- Disconnect primary power and place Primary Power ON/OFF Switch to OFF position.
- Unplug J3 from Logic PC Board to disable DC output circuit.
- Connect primary power and place Primary Power ON/OFF Switch to ON position and apply power.

A. GAS Light Off.

1. *Gas Source Problems*

   a. Check gas levels of cylinders, gas supply connections, or turn on gas supply, as required.

2. *Gas Leak Present*

   b. Check system for gas leaks. One way to verify gas leaks is to turn off the system and gas supply at source and watch pressure gauges on regulators. With no gas flow, the pressure at the regulators should remain constant. If pressure decreases, a leak is present in the system.

   c. If gases are supplied to system via a pipeline, check that all excess station drops are closed and there are no leaks in the pipeline.

NOTE

It is not recommended to supply both the Plasma and Shield gas from one (1) regulator via "Y" connections. It is an additional source for leaks and flow rates for gases can be impacted when one is changed.

WARNING

Use only pressure regulators to supply gas to the Ultima-150. ***Do not use Flowmeter Regulators.***

3. *Faulty Gas Pressure Switch*

NOTE

Both Plasma and Shield Gas Pressure Switches must be satisfied for the GAS light to be green.

a. Verify gas pressure from customer source is set to 35 psi.

b. Check the continuity of Plasma Gas Pressure Switch between J5-1 and J5-2. Connection should be closed if 35 psi gas pressure is supplied. If Pressure Switch is open, replace Plasma Gas Pressure Switch Assembly.

c. Repeat procedure above for Shield Gas Pressure Switch. Replace if required.

NOTE

Both the Plasma and Shield Gas Pressure Switches are in series connected to J5-1 and J5-2.

4. *Faulty Logic PC Board*

   a. If 35 psi pressure is supplied, and both the Plasma and Shield Gas Pressure Switches are functioning properly, the GAS Indicator Light should be green. If not, replace Logic PC Board.

B. Gas Flow Problems

1. *Faulty Flow meters*

   a. Turn Plasma and Shield gas supplies on at customer regulator and set to 35 psi.

   b. Adjust the Plasma and Shield Gas Flow meters on the front panel to desired flow rate. Gas should be flowing through to the torch. (Consult torch manual for proper flow rates to use.)

      If there are no Flowmeter readings or flow rates appear to be incorrect, check the torch for blockage. Remove blockage if required.

      If torch is clear and flow rates are still incorrect, replace Flow meter(s).

NOTE

For exact measurement of flow rates an external calibrated Flow Gauge is required.

2. *Faulty Plasma Gas Solenoid*

   If the gas pressure is 35 psi and Plasma Gas Flowmeter is functioning properly but there is no gas flow out the torch, the Plasma Solenoid may be faulty.

   a. Test the Plasma Gas Solenoid by measuring for 120 VAC across the 2 contacts on the Solenoid.

      If 120 VAC is present, replace Plasma Gas Solenoid.

      If 120 VAC is not present, replace the Logic PC Board.

NOTE

Plasma gas flow from torch is normally very minimal and barely noticeable on the hand.

3. *Faulty Shield Gas Solenoid*

   If the gas pressure is 35 psi and Shield Gas Flowmeter is functioning properly but there is no gas flow out the torch, the Shield Solenoid may be faulty.

   a. Testing the Shield Gas Solenoid requires a closed connection by jumping a switch between TB1 terminals 17 and 18. Make this connection if required.

   b. Test the Shield Gas Solenoid by measuring for 120 VAC across the 2 contacts on the solenoid. In this condition 120 VAC should be present.

      If 120 VAC is present, replace Shield Gas Solenoid.

      If 120 VAC is not present, replace the Logic PC Board.

   c. Disconnect the switch between TB1 terminals 17 and 18 if not required for welding operation.

4. *Faulty Transformer*

   If the Gas Solenoids and Logic PC Board are okay, there may not be 120 VAC coming into the Logic PC Board.

   a. Measure from J1-8 on Logic PC Board to primary power ON/OFF switch output terminal (L2 wire #2). Voltage should be 120 VAC.

      If proper voltage is not present, replace Transformer.

Once the problem has been identified and corrected, make sure the primary power is disconnected and the Primary Power ON/OFF Switch is placed in the OFF position and then reconnect J3 to Logic PC Board to enable DC output circuit. Repeat steps in Section 3.06, Basic Functions to ensure the system is fully functional.

3.10 Coolant Indicator Light Status

Under normal operating conditions, the COOLANT Indicator Light should be green once the unit is turned on. A red COOLANT light or a red-green COOLANT light indicates a possible problem or problems.

NOTE

When starting the system for the first time or if torch has been disconnected, there will be a 3-5 second delay before the light is green to allow time for the coolant to circulate through the system to the Flow Switch. It may be necessary to turn the system on and off several times to allow for complete coolant circulation and extraction of any entrapped air.

- Disconnect the primary power and place the Primary Power ON/OFF Switch to the OFF position.
- Unplug J3 from Logic PC Board to disable DC output circuit.
- Connect the primary power and place the Primary Power ON/OFF Switch to the ON position.

A. COOLANT Light Red (not blinking).

1. Coolant is Contaminated (conductive).

a. Disconnect the primary power and place the Primary Power ON/OFF Switch to the OFF position.

b. Flush coolant from system and replace with Thermal Arc® Coolant. To flush system, remove hose fitting at the filter end of the Coolant Filter Assembly and drain into an appropriate container. There is no need to turn on pump as gravity flow will drain the reservoir. Fill reservoir not less than 2 inches from top.

c. Check Deionizer Bag in reservoir. If completely straw-colored, replace bag. (Refer to Section 5, Parts Lists for parts information.)

d. Connect the primary power and place the Primary Power ON/OFF Switch to the ON position. COOLANT indicator light should be green. If not, check Conductivity Sensor.

2. Faulty Conductivity Sensor

a. Disconnect the primary power and place the Primary Power ON/OFF Switch to the OFF position.

b. Remove wire from Conductivity Sensor on side of Coolant Reservoir (wires 3 & 4).

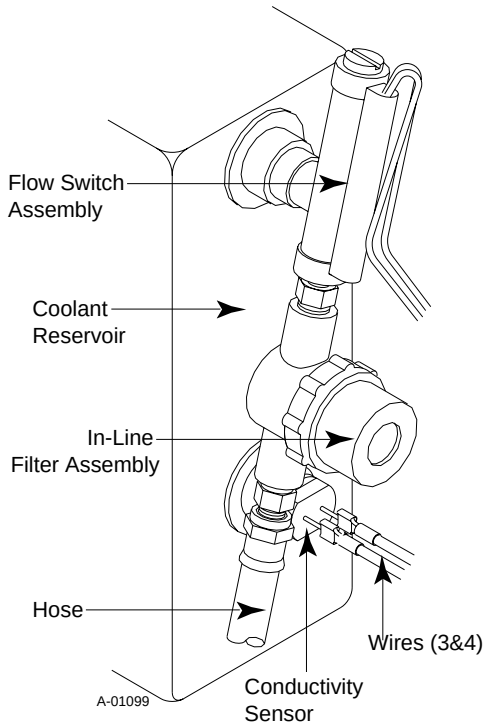


Figure 3-3 In-Line Filter Assembly

c. Replace Conductivity Sensor per procedures in 4.06, Conductivity Sensor Assembly Replacement.

d. Reconnect wires to Conductivity Sensor.

e. Connect the primary power and place the Primary Power ON/OFF Switch to the ON position. COOLANT indicator light should be green.

B. COOLANT Light Red-Green (blinking).

1. *Coolant Level Inadequate*

a. Disconnect the primary power and place the Primary Power ON/OFF Switch to the OFF position.

b. Check coolant level in Reservoir. Add coolant if necessary.

2. Blockage in Cooling System

a. Check In-Line Filter, Coolant Filter, torch and leads. Clean or replace, as necessary.

3. *Air in Cooling System*

a. Check the In-Line Filter Assembly. Coolant should be clear and without air bubbles as it flows through Filter. Check that all parts of cooling system are tightened so that air may not enter.

b. Connect primary power and place Primary Power ON/OFF Switch to ON position. Cycle system on and off several times to extract any entrapped air.

4. Faulty Flow Switch

a. Disconnect the primary power and place the Primary Power ON/OFF Switch in the OFF position.

b. Check the Flow Switch by disconnecting J11 from the Flow Switch and jumping the blue wires that go to the Logic PC Board or J5-5 & J5-6. (Refer to Figure 3-6 for parts identification.)

c. Connect the primary power and place Primary Power ON/OFF Switch to ON.

d. Connect a Ohm Meter to the Flow Switch. The COOLANT Indicator Light should be green. If the Flow Switch shows no continuity, replace the Flow Switch Assembly.

5. *Faulty Pump*

NOTE

The following procedure applies to units without optional Coolant Pressure Gauge installed. For units with optional Coolant Pressure Gauge installed, see note at end of this subsection.

a. If Motor/Fan rotates, check coolant pressure.

b. Remove Hex Head Plug from T-Connector mounted on the Pump Assembly and install a test Pressure Gauge of 0-80 psi - 1/4 NPT.

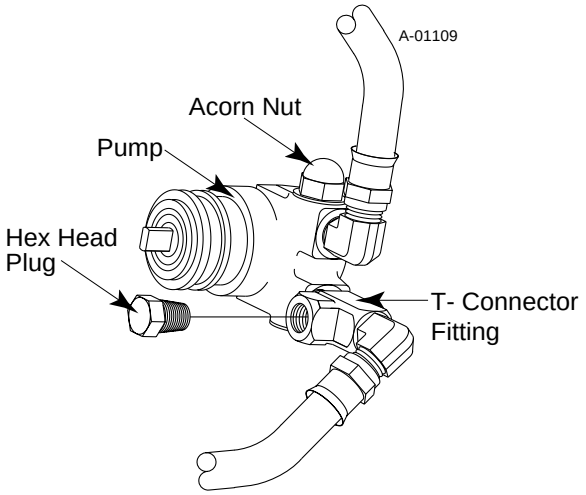


Figure 3-4 Pump Assembly Detail

c. Turn unit on and turn set screw clockwise until at 60 psi. Coolant Indicator Light should turn green (not flashing) and pump should start.

If pump does not start, remove pump and see if pump shaft turns freely. If not, replace pump.

NOTE

Pump/Motor operates on 230 volts AC and is supplied by the Transformer for any input voltage. The pump should sound quiet, not straining.

Optional Coolant Pressure Gauge

The purpose of the Coolant Pressure Gauge is to indicate pressure only. A faulty or incorrectly set Coolant Pressure Gauge will not affect the proper functioning of the unit or the status of the Indicator Lights. To test if the Coolant Pressure Gauge is functioning properly, remove the acorn nut from pump housing and turn clockwise until Coolant Pressure Gauge reads 60 psi. If gauge does not maintain setting, gauge is faulty. Replace Coolant Pressure Gauge, if desired. To test pump, remove Coolant Pressure Gauge and Adapter Fitting and follow procedure in (5) above.

6 *Faulty Transformer*

a. Check the Transformer. Measure the voltage from wire #2 on the Primary Power ON/OFF Switch to J1-5. Should be 120 VAC for 3 seconds.

If voltage is not correct, check voltage from wire #2 on the Primary Power ON/OFF Switch to J1-8. Should be 120 VAC whenever Primary Power ON/OFF Switch is in the ON position.

If voltage is not 120 VAC, replace Transformer.

7. *Faulty Motor*

a. Check if fan rotates. If fan is not rotating, check voltage from wire #2 on Primary Power ON/OFF Switch (refer to Figure 3-2 for wire location) to wire #22 on Main Contactor (shown below). Should be 230 VAC for 3 seconds.

If voltage is correct, replace Motor.

If the voltage is incorrect, continue with next step.

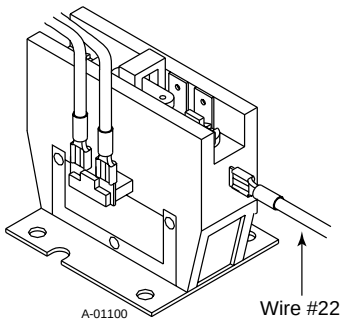


Figure 3-5 Main Contactor (MC)

8. *Faulty Logic PC Board or Main Contactor*

   a. Check for 120 VAC from J1 -5 to J4- 2 on Logic PC Board.

      If voltage is 0, replace Logic PC Board.

      If voltage is 120, replace Main Contactor.

C. COOLANT Light Off.

1. *Faulty Logic PC Board*

   a. Check TP2 to TP1 (ground) on Logic PC Board. Should be +12 VDC.

      If not, disconnect primary power, and place Primary Power ON/OFF Switch to OFF. Replace Logic PC Board.

Once the problem has been identified and corrected, make sure the primary power is disconnected and the Primary Power ON/OFF Switch is in the OFF position then reconnect J3 to Logic PC Board to enable DC output circuit. Repeat steps in Section 3.06 Basic Functions to ensure the system is fully functional.

3.11 PILOT Indicator Light Status

The pilot arc is initiated by turning the PILOT ARC ON Switch to ON, or remotely, by connecting TB1-12 to TB1-13 with a switch. The unit is shipped with a jumper from TB1-12 to TB1-13 so that there is only local control of the PILOT ARC ON function, but the user may replace this jumper with a switch if remote control is desired.

Under normal conditions the PILOT Indicator light is off until a pilot arc is demanded. When a pilot arc is demanded, the PILOT Indicator light should be green. There are several types of problems which can occur with the piloting.

NOTE

When primary power ON/OFF Switch is turned on, there is a 3-5 second delay initially to allow all interlocks to be satisfied. A pilot arc cannot be obtained during this time period.

The pilot arc is always latched off in the event of power supply interlock trip. The pilot must be disabled and then reenergized to initiate the pilot arc after a fault shutdown.

A. Pilot Arc demanded; pilot light off; pilot arc initiated.

1. *Faulty Logic PC Board*

   a. If the Pilot Indicator light is off when a pilot arc is demanded and the pilot is initiated, replace Logic PC Board.

B. Pilot Arc demanded; pilot light off; no pilot arc.

Plasma and Shield Gas Pressure Switches and the Coolant Flow Switch all can keep the pilot arc from initiating. Make sure these functions are all correct (refer to Sections 3.09 and 3.10). If these functions are okay, do the following to determine whether the problem is in the Logic or Pilot PC Board:

1. *Faulty Logic or Pilot PC Board.*

   a. Disconnect primary power and place the Primary Power ON/OFF Switch to OFF position.

   b. Remove the Ribbon Cable from J9 of the Pilot PC Board.

   c. Connect primary power and place the Primary Power ON/OFF Switch to ON position. Wait 5 seconds then turn Pilot Arc ON/SET Switch to ON.

      If the pilot light now comes on, the problem is in the Pilot PC Board. Disconnect the primary power and place the Primary Power ON/OFF Switch in the OFF position. Replace the Pilot PC Board.

      If the pilot light still does not come on, the problem is in the Logic PC Board. Disconnect the primary power and place the Primary Power ON/OFF Switch in the OFF position. Replace the Logic PC Board.

NOTE

Shield Gas flows only when Pilot Arc ON/SET Switch is in the ON position.

C. Pilot Arc demanded; momentary Pilot light on; no pilot arc initiated.

When pilot is demanded, if pilot current hasn't been established within about 2 seconds, the pilot is inhibited until the PILOT ARC ON/SET Switch is cycled off and on. This prevents the pilot from continuing to try to initiate a pilot into a damaged or shorted torch. If the pilot light comes on for about 2 seconds and then goes off with no pilot arc established, the control is working correctly, but something is causing the pilot not to initiate.

a. Check for the presence of 300vdc at J14-3 to J14-1, and at J14-7 to J14-5.

If this voltage is not above 240vdc, see the procedure for checking the Main Diode and Bridge Assembly in Section 3.14.

NOTE

When checking for the presence of the 300V, make sure the measuring instrument is isolated from GND because the 300V may be referenced to GND, and connecting a GND referenced measuring instrument may cause a high energy short.

If 300VDC is present, the problem must be in the torch or Pilot PC Board. Check the torch for a shorted tip or other problems (See the appropriate torch Instruction Manual).

If the torch is OK, replace the Pilot PC Board.

D. Pilot Arc demanded; Pilot light on, pilot initiated but erratic.

Erratic pilot can be caused by improper gas flow, air leaks in the gas system, or pilot current adjusted too low.

a. Check to make sure plasma and shield gas flow rates and pilot current are within the acceptable limits for the torch used. If not, correct them.

b. Check for gas leaks as in Section 3.09.

c. If all settings are OK, and pilot is still erratic, disconnect primary power and place the Primary Power ON/OFF Switch to OFF position and replace Pilot PC Board.

Once the problem has been identified and corrected, make sure the primary power is disconnected, and the Primary Power ON/OFF Switch is in OFF position, then reconnect J3 to Logic PC Board to enable DC output circuit. Repeat steps in Section 3.06, Basic Functions to ensure the system is fully functional.

3.12 DC Pilot Indicator Light Status

After a pilot has been successfully established, the main power converter can be turned on to provide weld power by shorting TB1-3 to TB1-4 with a switch or other contact. This should also cause the DC light to come on.

A. DC light does not come on when TB1-3 shorted to TB1-4.

1. Faulty Pilot or Logic PC Board

a. Check to make sure the Pilot PC Board is not inhibiting the main converter. Check this by turning input off, disconnecting the ribbon cable from J9 on Pilot PC Board, and turning input on.

If DC light now comes on when requested, replace Pilot PC Board.

If DC light does not come on even with J9 ribbon cable disconnected, replace the Logic PC Board.

B. DC light comes on but unit doesn't weld.

1. Faulty Logic PC Board; Loose Connections

a. If pilot is OK and DC light comes on when requested, check open circuit voltage. Do this by depressing the voltage switch to volts mode. This voltage should read approximately 50 to 60 VDC when the DC light is on and the arc is not transferred to a work piece.

If the open circuit voltage is OK, and the unit still will not weld, make sure the work lead connection is solid and corrosion free.

If this voltage is low, but not 0, replace the Logic PC Board.

If the open circuit voltage is 0, check the FET Boards as in Section 3.14. If these check OK, and all cables between FET Boards and Logic PC Board check OK, replace the Logic PC Board.

Once the problem has been identified and corrected, disconnect the primary power and place the Primary Power ON/OFF Switch to the OFF position. Reconnect J3 to Logic PC Board to enable DC output circuit. Repeat steps in Section 3.06, Basic Functions to ensure the system is fully functional.

3.13 A/V Display Status

Under non-welding conditions, the A/V numeric display is 00.

A. Incorrect A/V Display

1. Faulty Pilot PC Board.

a. If PREVIEW of pilot current doesn't display set point, check J6 Ribbon Cable Connector. If it is okay, replace the Pilot PC Board.

B. No A/V Display

1. Faulty Logic PC Board

a. If there is no A/V display, replace the Logic PC Board.

3.14 Static Test Procedures

A. Input Diode/Main Diode Bridge (D1) with Inrush Circuit Test Procedure

NOTE

This test requires a digital volt meter with a diode test scale.

1. Perform a visual inspection of Input Diode (D1) Bridge Assembly. This is located under the Input PC Board and can be accessed by removing the 7 connection screws.

   Most failures are identified by a fracture in the plastic case of the device. If there are no signs of physical damage or failure then proceed with the following test procedure:

2. Disconnect lead #7 from the negative terminal of Input Diode (D1) Assembly.

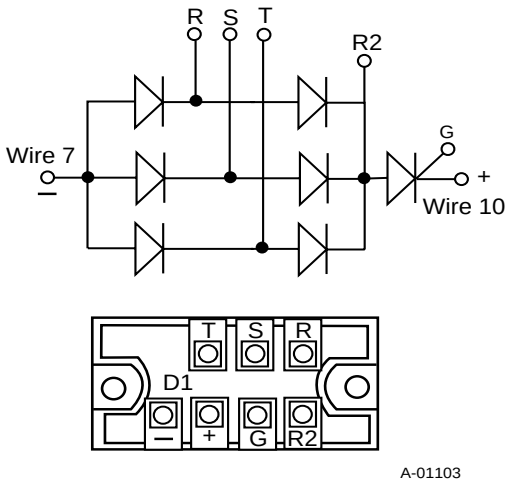


Figure 3-6 Input Diode Assembly

3. Set meter on diode test scale.

4. The Input Diode (D1) Assembly contains six standard diodes and a SCR used for the inrush circuit. The diodes are connected to form a three-phase full wave circuit with three diodes connected to the negative terminal and three connected to the R-2 terminal.

   Test each diode in the forward (R-2 to R, S, T) and reverse (- to R, S, T) direction as shown in Figure 3-6. A properly functioning diode conducts in the forward direction (plus to negative) and blocks in the reverse direction (negative to plus).

5. If any Diode section does not check properly, remove Input PC Board per Section 4.05.

6. To check the SCR in the Input Diode (D1) Assembly use the following procedure:

7. Remove the leads from terminals R-2, G, and positive (+).

8. Check for shorts between R-2 and the (+) terminal.

9. Check the gate between G and (+) terminals for resistance of approximately 50 ohms.

10. If the SCR does not check properly, replace the Input Diode (D1) Assembly per Section 4.05.

11. If the Input Diode (D1) Assembly checks are correct, reconnect the lead removed.

B. FET and Capacitor Assembly

The FET/Capacitor Assemblies can be checked by use of an ohmmeter set to a diode scale.

1. Disconnect power from the unit.

2. Read the following on each of the two FET/Capacitor Assemblies:

   - Diode drop from E2A to E3.
   - Diode drop from E4 to E1A.
   - Short from E3 to E4.

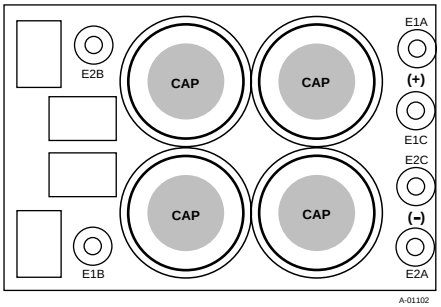


Figure 3-7 Capacitor PC Board Assembly Layout

3. With the meter on a low ohms scale, read the resistance from gate to emitter on each of the FETs (8 total on each assembly). These are the 3 leaded devices along each edge of the assembly. Each should read approximately 2.5K ohms from gate to emitter (across the 2 outside pins of each device).

   If any of these measurements are not correct, replace the affected FET and Capacitor Assembly.

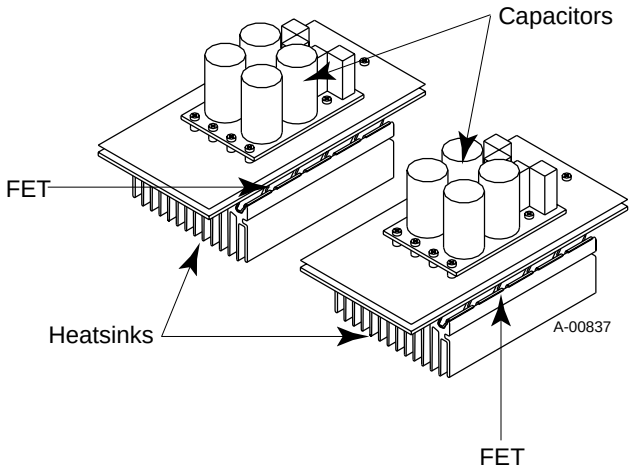


Figure 3-8 FET Locations

C. Output PC Board/Diode Bridge Assembly

NOTE

*The Ultima-150 has been manufactured using one of two (2) models of Diode Bridge Assemblies - either Model "A" or Model "B". Follow procedures as they apply to your unit. All units with Unit Serial Number ending with a letter prior to "**G**" are made with Model "A". All replacement Diode Bridge Assemblies are **Model "B"**.*

Make the following measurements with the power disconnected and with an ohmmeter set for a diode scale.

1. Measure a diode drop from each of the anode connections of the diode to the cathode connection.
2. Measure a diode drop from negative output (E1 on the Pilot PC Board) to work lead.

   If these measurements are not correct, replace the Output PC Board/Diode Assembly.

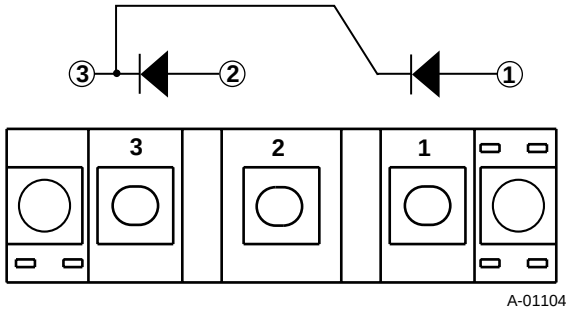


Figure 3-9 Model "A" Output Diode Bridge

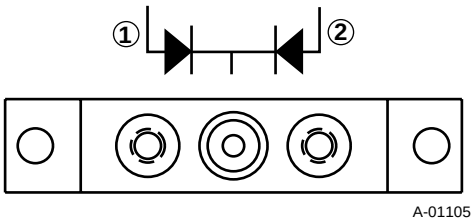


Figure 3-10 Model "B" Output Diode Bridge

SECTION 4:
REPAIRS & REPLACEMENT

4.01 Introduction

This section describes parts replacement procedures and all cable repairs that may be performed on the ULTIMA-150 Plasma Welding EMC Power Supply.

WARNING

Under no circumstances are field repairs to be attempted on Printed Circuit Board or other subassemblies of this unit. Evidence of unauthorized repairs may void the factory warranty.

4.02 General Anti-Static Handling Procedures

A. General

CAUTION

PC Boards can be irreparably damaged by improper handling due to electrostatic discharge (ESD).

Replacement PC Boards are shipped in protective enclosures to prevent damage from electrostatic discharge (ESD) during shipping. Included with each replacement board is a ground strap to prevent static damage during installation.

WARNINGS

Read and understand these instructions and the instructions on the grounding wrist strap package before opening the unit enclosure or removing the replacement PC Board from its protective enclosure.

Disconnect primary power to the system before disassembling the unit or any external connections.

Do not operate the unit or test equipment under power while wearing the grounding wrist strap.

B. Procedure

1. Open the wrist strap and unwrap the first two folds of the band. Wrap the adhesive side firmly around your wrist.
2. Unroll the rest of the band and peel the liner from the copper foil at the opposite end.
3. Attach the copper foil to a convenient and exposed electrical ground.
4. Connect the wrist strap to the same electrical ground as the unit ground.
5. Open the unit enclosure and remove the failed PC Board.
6. Carefully open the ESD protective bag and remove the replacement PC Board.
7. Install the replacement PC Board in the unit and make all necessary connections.
8. Place the failed PC Board in the ESD protective bag and seal for return shipping.
9. Reassemble the unit enclosure.
10. Remove the grounding wrist strap from your wrist and from the electrical ground connection before reconnecting primary power to the unit.

4.03 Parts Replacement - General Information

The parts replacement procedures described in this manual, with the exception of filter replacement, require some disassembly. Before disassembling any part of the ULTIMA-150 EMC Power Supply first read the procedure for the part to be replaced, then proceed with the disassembly.

WARNING

Repairing this unit is a process which should be undertaken only by those familiar with high voltage power electronic equipment.

WARNING

Disconnect primary power from the source before disassembling the power supply, opening modules or replacing parts on modules. Make sure AC indicators on the ULTIMA-150 EMC Power Supply front panel is not ON.

4.04 Opening The ULTIMA-150 Plasma Welding EMC Power Supply

1. Remove the four Phillips head screws on the top of the Enclosure Cover.
2. Loosen the six Phillips head screws, three on each side, at the bottom edge of the Enclosure Cover.
3. Carefully pull the Enclosure Cover up from the rest of the unit.

4.05 PC Board Replacement Procedures

A. Logic/Display PC Board Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Locate the Logic/Display PC Board Assembly on the frame at the top front of the unit.
3. Note the location of all the connections to the Logic/Display PC Board Assembly. Label all connectors.
4. Carefully remove all the cable connections to the Logic/Display PC Board Assembly.
5. Using a small blade screw driver loosen the screw securing the CURRENT adjustment knob at the front panel.
6. Remove the two Phillips head screws, one each corner, securing the front of the Logic/Display PC Board Assembly to the frame.
7. Lightly pry under the rear edge of the PC Board to lift the PC Board Assembly off the three PC Board supports. The supports are located across the back edge of the PC Board Assembly, one in each back corner and one in the center.
8. Install the replacement Logic/Display PC Board Assembly by reversing the above steps. The PC Board Assembly snaps onto the PC Board supports.

NOTE

Make sure that the PCB snaps into place when pushed down over the supports.

B. Input PC Board Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Remove the Logic/Display PC Board per paragraph 'A" above.
3. Locate the Input PC Board Assembly under the Logic/Display PC Board.
4. Note the location of all the cable connections to the Input PC Board Assembly.
5. Carefully remove all the connections to the Input PC Board Assembly. Label all connectors.
6. Remove the two Phillips head screws at the terminals that have no wires connected.
7. Remove the clear protective sheet and Input PC Board from the unit.
8. Place the clear protective sheet over the replacement Input PC Board.
9. Install the replacement Input PC Board Assembly by reversing the above steps.

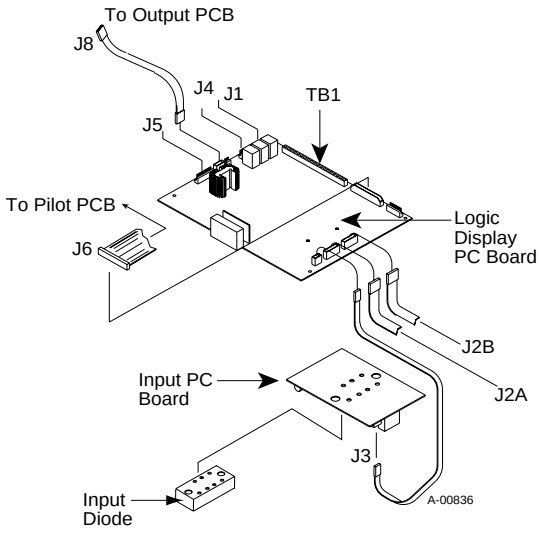


Figure 4-1 Logic Display and Input PC Board Assemblies (as viewed from front of unit)

C. Output PC Board Replacement

NOTE

The Output PC Board, Diode Bridge and Heatsink Assemblies must be removed in order to detach the PC Board from the Heatsink.

1. Remove the Enclosure Cover per Section 4.04.
2. Locate the Output PC Board Assembly on the left side internal frame, as viewed from the front of the unit.
3. Note the location of all the cable connections to the Output PC Board Assembly.

4. Carefully remove all the cable connections to the Output PC Board Assembly.

NOTE

Be extremely careful when removing the 2 transformer leads from the Current Sense Toroids. Excessive force could damage the Toroids.

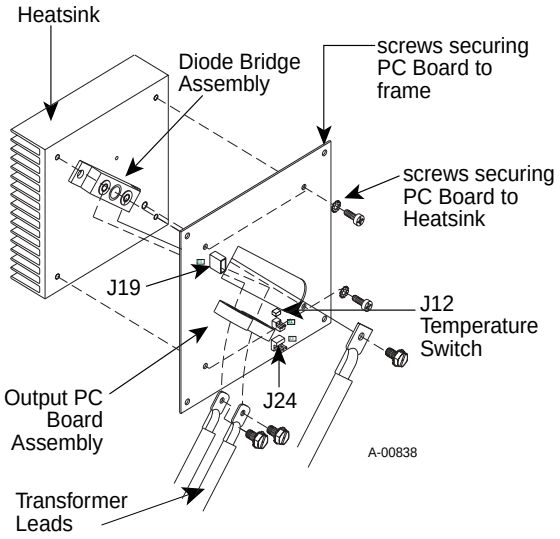


Figure 4-2 Output PCB , Exploded View

5. Remove the 4 Phillips head screws, one each corner, that secure the Output PC Board Assembly to the frame.

NOTE

Do not remove the 4 screws with lock washers located towards the center of the PCB. This will cause the Heatsink (attached to the backside of the PCB) to fall off.

6. Slide the Output PC Board/Heatsink Assemblies out of the unit.
7. Remove the four screws and washers securing the Heatsink to the PCB.
8. Install the replacement Output PC Board Assembly by reversing the above steps. Torque all screws to 35 in-lbs.

D. Pilot PC Board Replacement

The Pilot PC Board Assembly consists of two PC Boards mounted to a vertical frame.

NOTE

The two Pilot PC Boards must be replaced as one assembly.

1. Remove the Enclosure Cover per Section 4.04.
2. Locate the Pilot PC Board Assembly near the rear of the unit.
3. Note the location of all the cable connections to the Pilot PC Boards.
4. Carefully remove all the cable connections to the Pilot PC Boards.
5. Using a small screw driver, lightly pry under the edge of the front PC Board to lift the Pilot PC Board Assembly off the four PC Board supports. The supports are in each of the four corners of the Pilot PC Board.
6. Remove the two Phillips head screws securing the Pilot PC Board Assembly frame to the upper frame.
7. Carefully pull the remaining Pilot PC Board and mounting frame from the unit.
8. Remove the rear Pilot PC Board from the mounting frame the same as in Step 5.
9. Install the replacement Pilot PC Board Assembly by reversing the above steps.

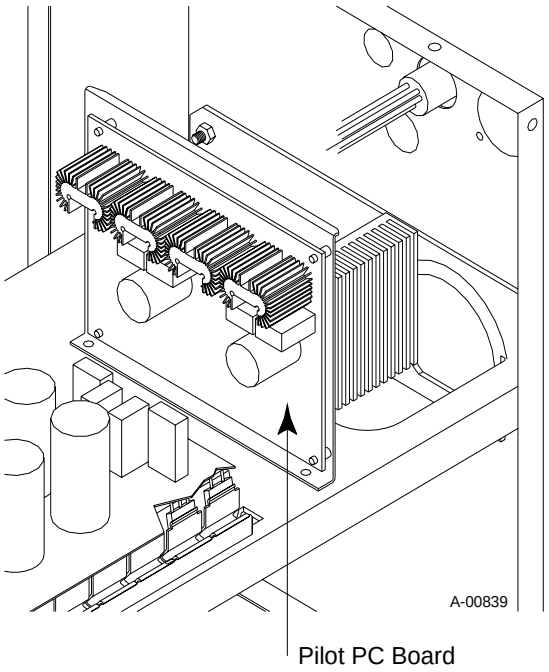


Figure 4-3 Pilot PC Board Assembly

4.06 Reservoir Parts Replacement Procedures

A. Coolant Reservoir Replacement

CAUTION

Handle and dispose of the used coolant per recommended procedures.

1. Drain the coolant from the Coolant Reservoir per the following procedure:
   a. Disconnect the Coolant Supply Hose input connection at the rear panel Coolant Filter Assembly. The hose goes from the bottom of the reservoir to the Coolant Filter Assembly.
   b. Place the end of the hose into a container to catch the coolant as it flows from the reservoir.

NOTE

Do Not run the pump as the coolant will gravity feed from the reservoir.

   c. Remove the Coolant Reservoir Cap then remove the Deionizer Basket and Deionizer Bag from the Coolant Reservoir filler hole.
2. Remove the Coolant Supply Hose output connection from the bottom of the reservoir.

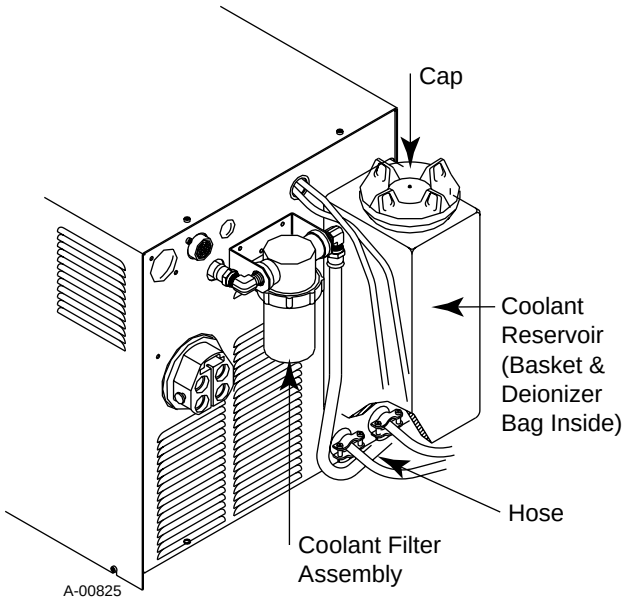


Figure 4-4 Coolant Reservoir Replacement

3. Remove the Enclosure Cover per Section 4.04.
4. Remove the hose connected to the bottom of the In-Line Filter Assembly.

NOTE

Some residual coolant will drain from the In-Line Filter. It is recommended that a rag or towels be placed below the hose prior to removing.

5. Remove the two wires from the Conductivity Sensor located on the end of the Coolant Reservoir near the center.
6. Unplug the wiring connection at the Flow Switch Assembly located on the end of the Coolant Reservoir near the top (return Hole).

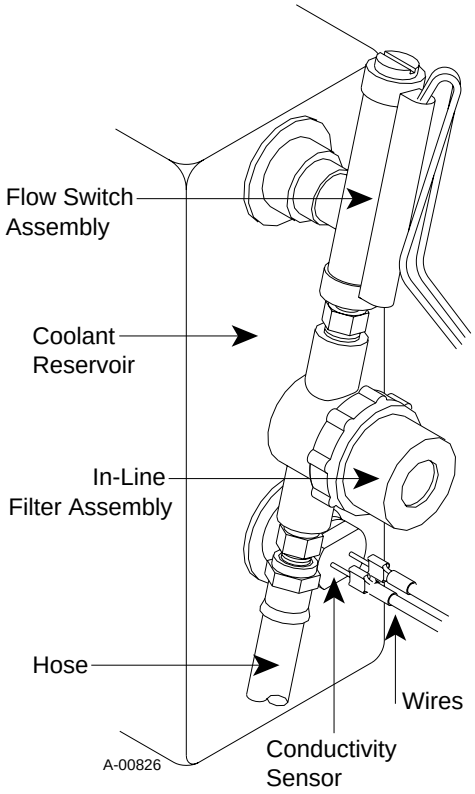


Figure 4-5 In-line Filter/Flow Switch Assembly

7. To make the removal of the reservoir easier the rear panel should be moved out per the following procedure:
   a. On the inside of the rear panel locate the two mounting studs, one near Quick Disconnect Assembly and one near the side of the reservoir, on the internal frame.

b. Remove the two nuts and lock washers securing the rear panel to the mounting studs. One of the studs has a ground wire attached to it.

c. Locate the two strain reliefs at the rear panel.

d. Loosen the screws securing the two strain reliefs to the cables.

e. Locate the two Phillips head screws under the rear of the unit securing the rear panel to the chassis.

f. Remove the two screws and carefully pull the reservoir side of the rear panel out from the unit only far enough to gain access to the reservoir mounting.

8. Remove the four screws, flat washers, and nuts that secure the Coolant Reservoir to the mounting panel.

9. Slide the reservoir towards the inside of the unit lifting it enough to clear the output flange on the bottom of the reservoir.

10. Tilt the other end of the reservoir up to allow the bottom of the reservoir to slide through the opening in the rear panel.

11. Lower the reservoir down to allow the filler opening of the reservoir to go through the rear panel opening.

12. The parts on the Coolant Reservoir must be removed and installed on the replacement per the following:

    a. Note the orientation of the In-Line Filter/ Flow Switch Assemblies and Conductivity Sensor to the Coolant Reservoir.

    b. Remove the In-Line Filter/Flow Switch Assemblies and Conductivity Sensor from the Coolant Reservoir and install it on the replacement Coolant Reservoir the same as noted in Step 12a. (See Figure 4-5.)

13. Reinstall the replacement Coolant Reservoir by reversing the above steps.

NOTE

Use thread sealant on all fittings when re-installing.

14. Refill the Coolant Reservoir with the coolant removed or fresh Thermal Arc Torch Coolant.

15. Place the Deionizer Basket and Bag into the Coolant Reservoir filler hole and install the Coolant Reservoir Cap.

B. In-Line Filter Replacement

1. Remove the Enclosure Cover per Section 4.04. For parts location information, refer to Figure 4-6, In-Line Filter/Flow Switch Assembly.

CAUTION

Handle and dispose of the used coolant per recommended procedures.

2. Drain the coolant from the Coolant Reservoir per the following procedure:

    a. Disconnect the Input Hose at the Rear Panel Filter Assembly. The hose goes from the bottom of the reservoir to the Filter Assembly.

    b. Place the end of the hose into a container to catch the coolant as it flows from the reservoir. Only enough needs to be removed so that the level is below the In-Line Filter/Flow Switch Assembly hole located on the end of the reservoir.

NOTE

Do Not run the pump as the coolant will gravity feed from the reservoir.

3. Remove the hose connected to the bottom of the In-Line Filter Assembly.

NOTE

Some residual coolant will drain from the In-Line Filter. It is recommended that a rag or towels be placed below the hose prior to removing.

4. Remove bowl on Filter.

5. Remove filter body from Flow Switch.

6. Remove fittings from filter body.

7. Install the replacement In-Line Filter Assembly by reversing the above steps.

NOTE

Use thread sealant on all the pipe threads when reinstalling.

8. Refill the Coolant Reservoir with the coolant removed or add fresh Thermal Arc Torch Coolant.

C. Flow Switch Assembly Replacement

1. Remove the Enclosure Cover per Section 4.04.

CAUTION

Handle and dispose of the used coolant per recommended procedures.

2. Drain the coolant from the Coolant Reservoir per the following procedure:
   a. Disconnect the input hose at the rear panel Filter Assembly. The hose goes from the bottom of the reservoir to the Filter Assembly.
   b. Place the end of the hose into a container to catch the coolant as it flows from the reservoir. Only enough needs to be removed so that the level is below the In-Line Filter/Flow Switch Assembly hole located on the end of the reservoir.
3. Unplug the wiring connection at the Flow Switch Assembly located on the end of the Coolant Reservoir near the top (return Hole).
4. Remove the hose connected to the bottom of the In-Line Filter Assembly.

NOTE

Some residual coolant will drain from the In-Line Filter. It is recommended that a rag or towels be placed below the hose prior to removing.

5. Remove Filter bowl from filter body.
6. Remove filter body from Flow Switch Assembly.
7. Remove Flow Switch Assembly from Coolant Reservoir.

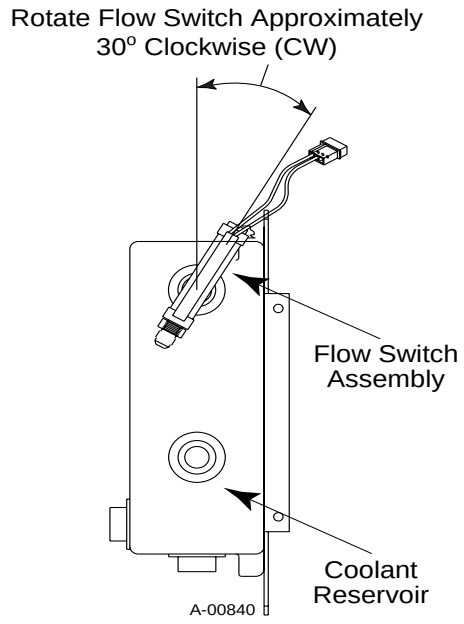


Figure 4-6 Flow Switch Orientation

8. Install the replacement Flow Switch Assembly by reversing the above steps.
9. Refill the Coolant Reservoir with the coolant removed or add fresh Thermal Arc Torch Coolant.

D. Conductivity Sensor Assembly Replacement

1. Remove the Enclosure Cover per Section 4.04.

CAUTION

Handle and dispose of the used coolant per recommended procedures.

2. Drain the coolant from the Coolant Reservoir per the following procedure:
   a. Disconnect the input hose at the rear panel Filter Assembly. The hose goes from the bottom of the reservoir to the Filter Assembly.
   b. Place the end of the hose into a container to catch the coolant as it flows from the reservoir. Only enough needs to be removed so that the level is below the Conductivity Sensor Assembly hole located on the end of the Coolant Reservoir near the center.

NOTE

Do Not run the pump as the coolant will gravity feed from the reservoir.

3. Remove the two wires from the Conductivity Sensor Assembly.
4. Remove the Conductivity Sensor Assembly from the Coolant Reservoir.
5. Install the replacement Conductivity Sensor Assembly by reversing the above steps.

NOTE

Use thread sealant on all the pipe threads when reinstalling.

6. Refill the Coolant Reservoir with the coolant removed or add fresh Thermal Arc Torch Coolant.

4.07 Motor Assembly Parts Replacement

A. Pump Assembly Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Disconnect the two Hose Assemblies at the fittings on the Pump Assembly.
3. Loosen the Pump Clamp securing the Pump Assembly to the Motor Assembly.
4. Note the orientation of the Pump Assembly to the Motor Assembly.

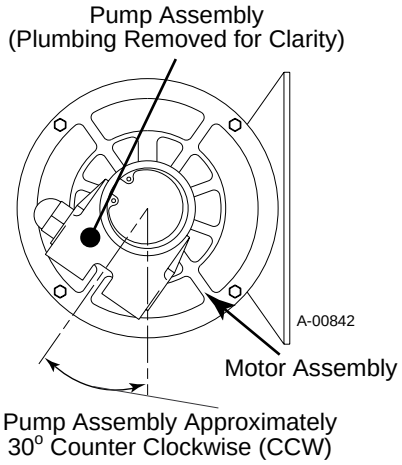


Figure 4-7 Pump Assembly Orientation

5. Pull the Pump Assembly from the Motor Assembly.
6. Remove the Pump Assembly from the unit.

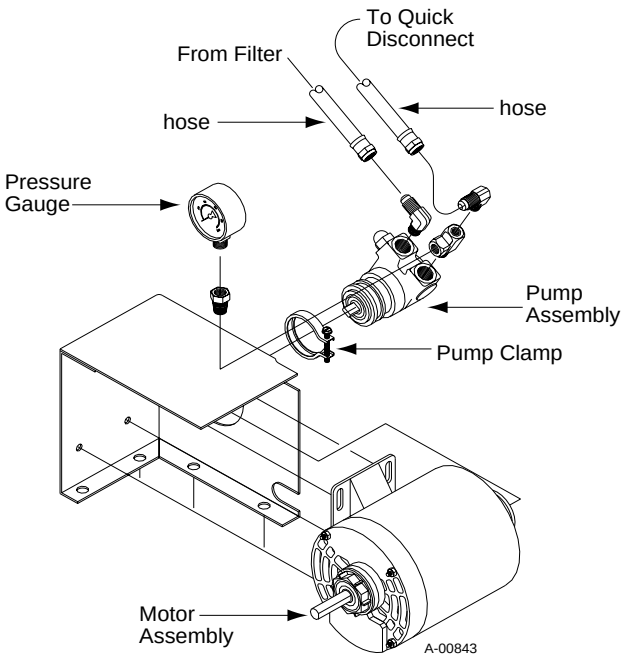


Figure 4-8 Pump Assembly

7. Remove Pressure Gauge from T- Fitting.
8. Remove Tee Fitting from Pump Outlet.
9. Remove 90 degree fitting from Pump Inlet.
10. Install the replacement Pump Assembly by reversing the above steps. Be sure to align the Pump Assembly to the Motor Assembly as noted in Step 4.

NOTE

Use Pipe Thread Sealant on all pipe threads. Allow 1/2" clearance between outlet fittings and base.

11. Refill Coolant Reservoir.
12. Connect primary power and turn on unit.
13. Check the coolant pressure. If the coolant pressure exceeds 60 psi, remove the acorn nut on the side of the pump and adjust the screw until the pressure is 55-60 psi. Replace the acorn nut. Turn off unit and disconnect power.

B. Fan Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Tilt the ULTIMA-150 Plasma Welder on its side far enough to gain access to the four Motor Mounting bolts on the bottom of the unit.
3. Loosen the four bolts securing the Motor Panel Assembly.
4. Slide the complete Motor Assembly, Fan, Pump, and Mounting Panel towards the rear of the unit.
5. Loosen the screw securing the Fan to the Motor Assembly shaft.
6. Note the way the Fan is installed on the Motor Assembly shaft.
7. Carefully slide the Fan off the Motor Assembly shaft.
8. Install the replacement Fan by reversing the above steps noting the following:
   a. Install the Fan the same as noted in Step 6.
   b. The Motor Assembly shaft must be flush with the front part of the Fan Bushing.
   c. Apply Loctite to the fan screw before tightening.

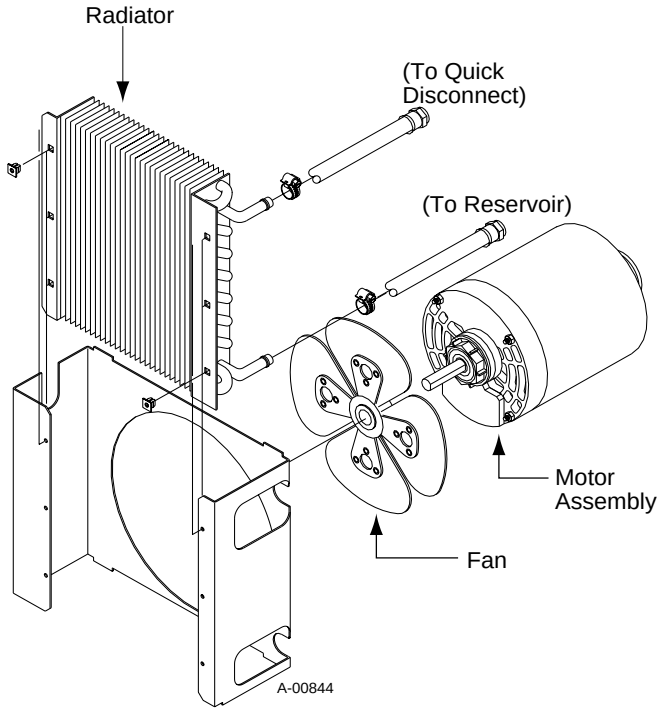


Figure 4-9 Fan and Motor Assemblies

C. Motor Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Remove the Pump Assembly per paragraph 'A' above.
3. On the Motor Assembly note where the Motor wiring terminates.
4. Locate the Hose Assembly attached to the upper radiator connection.
5. Loosen the hose clamp and remove the Hose Assembly.
6. Disconnect the Motor Assembly wiring from the Contact Assembly and the ground screw.
7. Tilt the ULTIMA-150 Plasma EMC Power Supply on its side far enough to gain access to the four motor mounting bolts on the bottom of the unit.
8. Remove the four bolts securing the Motor Panel Assembly.
9. Remove the complete Motor Assembly, Fan, and Mounting Panel from the unit.
10. Note the way the Fan is installed on the Motor Assembly shaft.
11. Loosen the screw securing the Fan to the Motor Assembly shaft and remove the Fan.
12. Remove the four bolts and washers that secure the Motor Assembly to the Motor Mounting.
13. Install the replacement Motor Assembly by reversing the above steps noting the following:

NOTE

Before installing the replacement Motor, check that the internal wiring of the Motor is set for the proper input voltage per the information on the Motor nameplate.

   a. Install the Fan the same as noted in Step 10.
   b. The Motor Assembly shaft must be flush with the front part of the Fan Bushing.
   c. Apply loctite to the fan screw before tightening.
   d. Proper orientation of the Pump Assembly to the Motor Assembly per paragraph 'A'.

D. Radiator Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Remove the Logic/Display PC Board per Section 4.05-B.
3. Remove the Front Panel.
4. Drain coolant below Return level.
5. Loosen Hose Clamps and remove Hoses from Radiator.
6. Carefully remove Thermostat Switch (solid state).
7. Loosen Fan and slide towards the motor.
8. Remove (6) screws securing Radiator.
9. Slide Radiator to the left. Rotate counterclockwise until fittings clear bracket.
10. Slide Radiator to the right to remove.
11. Install the replacement Radiator by reversing the above steps.

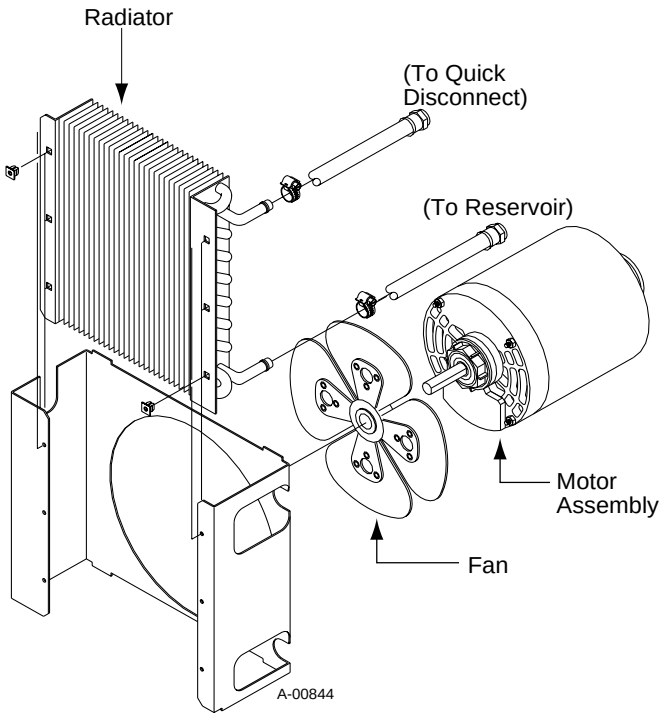


Figure 4-10 Radiator Assembly

4.08 Coolant Filter Assembly Replacement

The Coolant Filter Assembly is located on a bracket on the rear panel of the unit.

1. Remove the two coolant hose connections to the Filter Assembly.
2. Remove the two elbow fittings on each side of the Coolant Filter Assembly and remove the damaged Coolant Filter Assembly from the bracket.
3. Clean the old thread sealer from the threads of the elbow fittings.
4. Apply a thin coating of liquid Teflon thread sealer to the threads of the elbow fittings.
5. Place the replacement Coolant Filter Assembly in the bracket with the arrow pointing to the left and reinstall the two elbow fittings.
6. Reconnect the two coolant hoses to the Coolant Filter Assembly making sure that the hose to the Pump Assembly is on the output of the Coolant Filter Assembly (left side as viewed from the back).

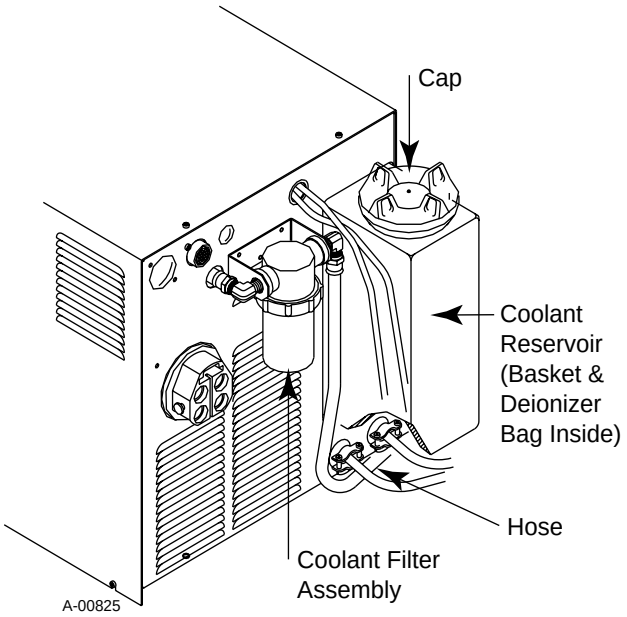


Figure 4-11 Coolant Filter Assembly

4.09 Hose Assembly Replacements

This subsection describes the replacement of the various Hose Assemblies used in the ULTIMA-150 Plasma Welder. Refer to Section 5, Replacement Parts for the part number and location of each part. For a block diagram of the ULTIMA-150 Plasma Welding Hose Assemblies refer to Appendix V.

A. Coolant Supply Hose (Reservoir to Coolant Filter) Assembly Replacement

The Coolant Supply Hose Assembly goes from the Coolant Reservoir to the Coolant Filter Assembly mounted on the rear panel. Replace the Hose Assembly using the following procedure:

1. Drain the coolant from the Coolant Reservoir per the following procedure:
    a. Disconnect the input hose at the rear panel Coolant Filter Assembly. The hose goes from the bottom of the reservoir to the Coolant Filter Assembly.
    b. Place the end of the hose into a container to catch the coolant as it flows from the reservoir.

NOTE

Do Not run the pump as the coolant will gravity feed from the reservoir.

CAUTION

Handle and dispose of the used coolant per recommended procedures.

2. Disconnect the other end of the Hose Assembly from the Coolant Reservoir.
3. Remove the Hose Assembly from the unit.
4. Install the replacement Hose Assembly by reversing the above steps.
5. Refill the ULTIMA-150 Plasma Welder with Thermal Arc® Torch Coolant before applying power.

B. Coolant Supply Hose (Coolant Filter to Pump) Assembly Replacement

The Coolant Supply Hose Assembly goes from the rear panel Coolant Filter Assembly to the Pump Assembly. Replace the Hose Assembly using the following procedure:

1. Remove the Enclosure Cover per Section 4.04.
2. Disconnect the Hose Assembly from the Coolant Filter Assembly on the rear panel.
3. Remove the other end of the Hose Assembly from the Pump Assembly.
4. Remove the Hose Assembly from the unit.
5. Install the replacement Hose Assembly by reversing the above steps.

C. Coolant Return Hose (TORCH Connector to Radiator) Assembly Replacement

The Coolant Return Hose Assembly goes from the TORCH Connector to the upper side of the Radiator. Replace the Hose Assembly using the following procedure:

1. Remove the Enclosure Cover per Section 4.04.
2. Disconnect the other end of the Hose Assembly from the check valve on the rear panel TORCH connector.
3. Locate the end of the Coolant Return Hose Assembly connected to the upper part of the radiator.
4. With a screwdriver loosen the Hose Clamp around the Hose Assembly.
5. Pull the Hose Assembly from the Radiator.
6. Remove the Hose Assembly from the unit.
7. Install the replacement Hose Assembly by reversing the above steps.

NOTE

It is very important that this hose goes between the two gas hoses.

D. Coolant Supply Hose (Pump to TORCH Connector) Assembly Replacement

The Coolant Supply Hose Assembly goes from the Pressure Gauge on the Pump Assembly to rear panel TORCH Connector. Replace the Hose Assembly using the following procedure:

1. Remove the Enclosure Cover per Section 4.04.
2. Remove the end of the Hose Assembly from the Pump.
3. Disconnect the Hose Assembly from the rear panel TORCH Connector.
4. Remove the Hose Assembly from the unit.
5. Install the replacement Hose Assembly by reversing the above steps.

E. Coolant Return Hose (Radiator to In-Line Filter) Assembly Replacement

The Coolant Return Hose Assembly goes from the bottom outlet on the Radiator to the inlet side of the In-Line Filter Assembly inside unit. Replace the Hose Assembly using the following procedure:

1. Remove the Enclosure Cover per Section 4.04.
2. Disconnect the other end of the Hose Assembly from the inlet side of the In-Line Filter Assembly.
3. Locate the end of the Hose Assembly at the lower part of the radiator.
4. With a screwdriver loosen the Hose Clamp around the Hose Assembly.
5. Pull the Hose Assembly from the Radiator and out of the unit.
6. Install the replacement Hose Assembly by reversing the above steps.

4.10 Internal Parts Replacement

This subsection describes the replacement of various internal parts. Refer to Section 5, Parts Lists for the part number and location of each part.

A. Contactor Assembly Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Label all the wiring connected to the Contactor Assembly.
3. Disconnect the wires from the Contactor Assembly (push on terminals).
4. Remove the two nut/washers securing the Contactor Assembly to the base.
5. Install the replacement Contactor Assembly by reversing the above steps.

B. Fuse Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Locate the Fuse on the side of the chassis above the Front Panel Breaker Assembly.
3. Remove the Fuse.
4. Reinstall the replacement Fuse by reversing the above steps.

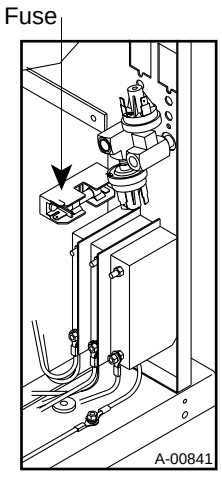


Figure 4-12 Fuse Location

C. Transformer Assembly Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Disconnect "Filter to Pump" hose from outlet of Filter.
3. Remove rear panel hardware.
4. Rotate rear panel to the right.
5. Locate and disconnect all Transformer wires.
6. Remove the four nuts/washers securing the Transformer Assembly to the base.
7. Remove Transformer Assembly.
8. Install the replacement Transformer Assembly by reversing the above steps.

D. Output Diode Bridge Assembly Replacement

NOTE

*The Ultima-150 has been manufactured using one of two (2) models of Diode Bridge Assemblies - either Model "A" or Model "B". Follow procedures as they apply to your unit. All units with unit serial number ending with a letter prior to "**G**" are made with Model "A". All replacement Diode Bridge Assemblies are **Model "B"**.*

1. Remove the Enclosure Cover per Section 4.04.
2. Locate the Diode Bridge Assembly on the left side internal frame, as viewed from the front of the unit.
3. Note the location of all the cable connections to the Diode Bridge Assembly. Figure 4-13 below indicates the connections for Model "A" and Figure 4-14 shows the connections for Model "B".

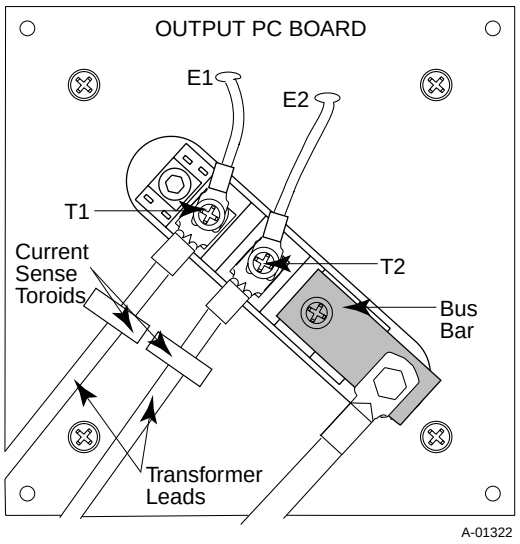


Figure 4-13 Connections for Model "A" Output Diode Bridge Assembly

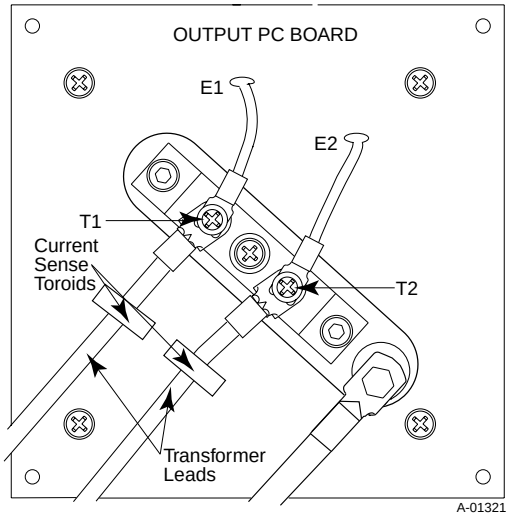


Figure 4-14 Connections for Model "B" Output Diode Bridge Assembly

4. Carefully remove all the cable connections to Output Diode Bridge Assembly.

NOTE

Be extremely careful when handling the 2 transformer leads. Excessive force could damage the Toroids.

5. Remove two (2) socket head cap screws and two (2) lock washers on the Diode Bridge Assembly.

6. Remove the Phillips head screw and star washer securing the Diode Bridge Assembly to the Heatsink.

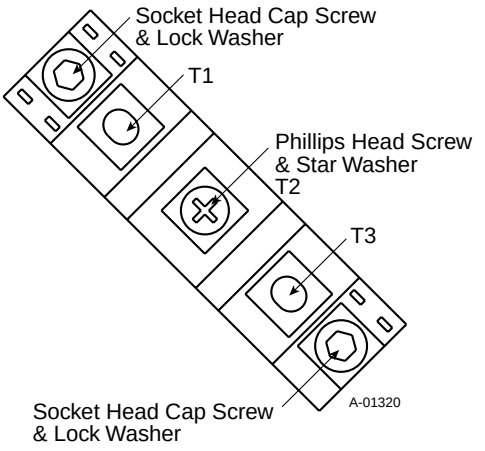


Figure 4-15 Model "A" Diode Bridge Assembly (top view)

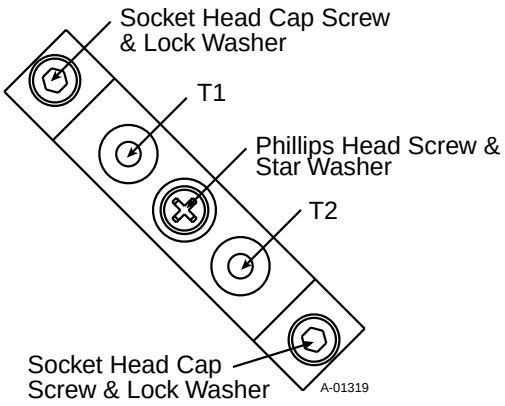


Figure 4-16 Model "B" Diode Bridge Assembly (top view)

7. Remove the Diode Bridge Assembly and Thermal Pad.
8. Clean bottom of Heatsink with a clean soft cloth and isopropyl alcohol and place Thermal Pad on Heatsink.

NOTE

Use new screws supplied with new Diode Bridge Assembly. Do not reuse old screws.

9. Secure Heatsink as shown in Figure 4-16 above. Torque all screws to 35 in- lbs.
10. Reconnect all cable connections as shown in Figure 4-14.
11. Replace Enclosure Cover.

E. Output PCB/Diode Bridge/Heatsink Assembly Replacement

NOTE

These parts can be replaced as one assembly (See Section 5.04, Parts Lists, for replacement parts.

1. Remove the Enclosure Cover per Section 4.04.
2. Locate the Output PCB/Diode Bridge/Heatsink Assembly on the left side internal frame, as viewed from the front of the unit.
3. Note the location of all the cable connections to the Assembly.

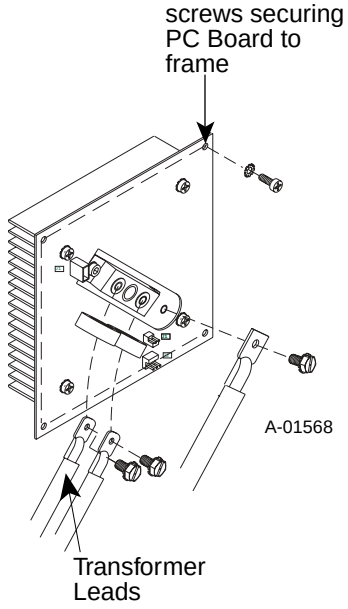
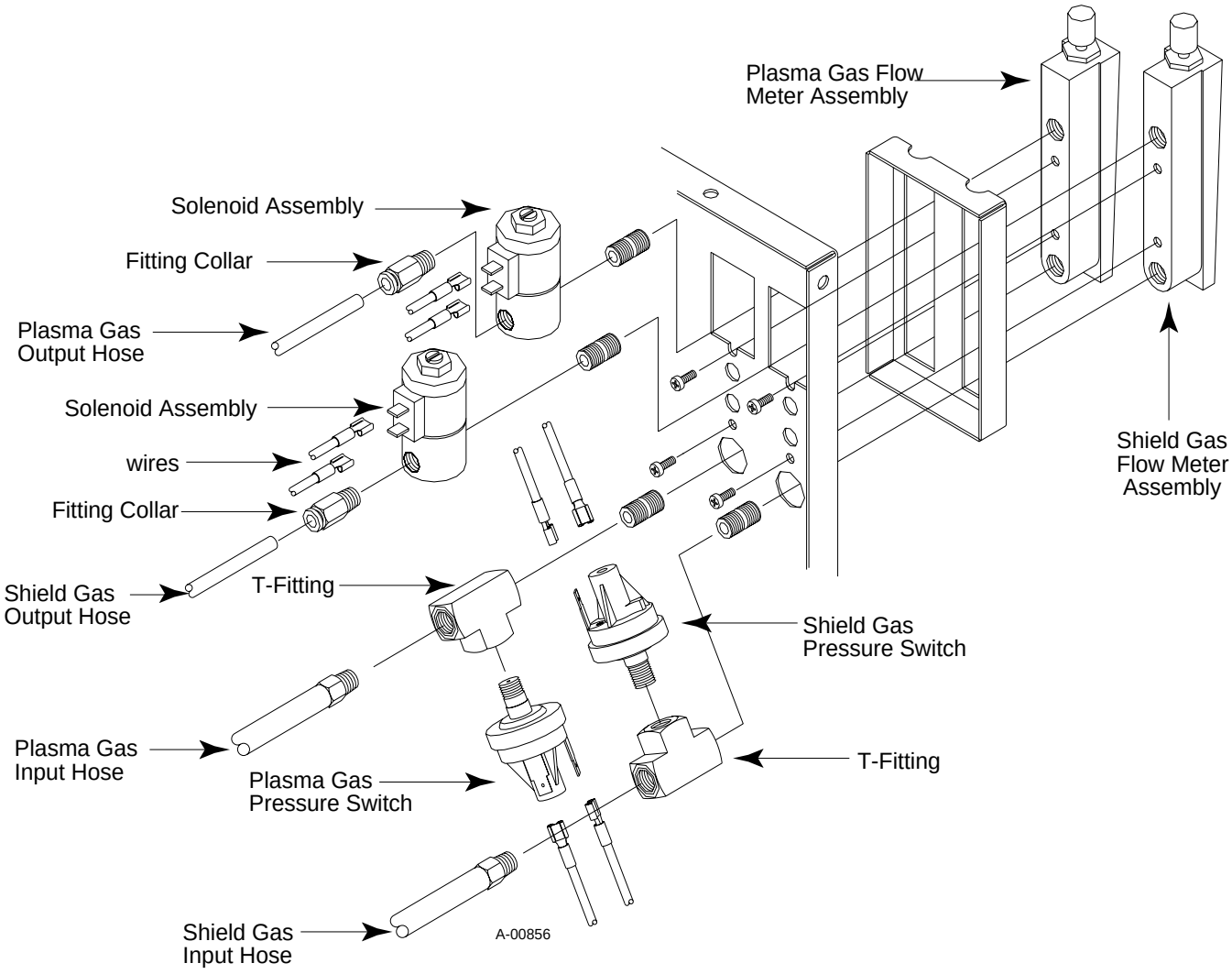


Figure 4-17 Output PCB/Heatsink/Diode Bridge Assembly

4. Carefully remove all the cable connections to the Assembly.

NOTE

Be extremely careful when removing the 2 transformer leads from the Current Sense Toroids. Excessive force could damage the Toroids.



4-18 Front Panel Parts

5. Remove the 4 Phillips head screws, one each corner, that secure the Output PC Board Assembly to the frame.

NOTE

Do not remove the 4 screws with lock washers located towards the center of the PCB. This will cause the Heatsink (attached to the backside of the PCB) to fall off.

6. Slide the Output PCB/Diode Bridge/Heatsink Assembly out of the unit.
7. Install the replacement PCB/Diode Bridge/Heatsink Assembly by reversing the above steps.

F. Input Diode Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Locate the Input PC Board Assembly at the front of the unit, below the Logic PC Board.

NOTE

To remove the Input Diode, both the Logic PC Board and Input PC Board must be removed first.

3. Remove Logic PC Board and Input PC Board per procedures in section 4.05 A & B.
4. Remove Heatsink from mounted studs on chassis.
5. Clean bottom of replacement Heatsink with a clean soft cloth and isopropyl alcohol and place Thermal Pad on replacement Heatsink.
6. Replace Heatsink by reversing steps 1-4. Torque screws to 35 in-lbs.

G. FET/Heatsink/Capacitor/ Input PC Board/ Input Diode Assembly Replacement

Note

Both FET/Heatsink/Capacitor/PC Board assemblies should be replaced if either assembly fails. The Input Diode should also be replaced. For procedures on replacing the Input Diode, see section 4.10 F. To order the FET/Heatsink/Capacitor/PCB and Input Diode as one assembly, see Section 5.04, Parts Lists.

There are two FET/Heatsink/Capacitor PC Board assemblies in the ULTIMA-150 Plasma Welding EMC Power Supply. The assemblies are replaced using the same method.

1. Remove the Enclosure Cover per Section 4.04.
2. Remove the Logic/Display PC Board per paragraph 'A" above.
3. The Logic/Display PC Board is attached to a frame. Tilt the frame forward to gain access to the FET/Heatsink/Capacitor PC Board assemblies.
4. Locate the FET/Heatsink/Capacitor PC Board Assembly to be replaced.
5. Note the location of all the cable connections to the FET/Heatsink/Capacitor PC Board Assembly.
6. Carefully remove all the cable connections to the FET/Heatsink/Capacitor PC Board Assembly, except the Ribbon Cable.

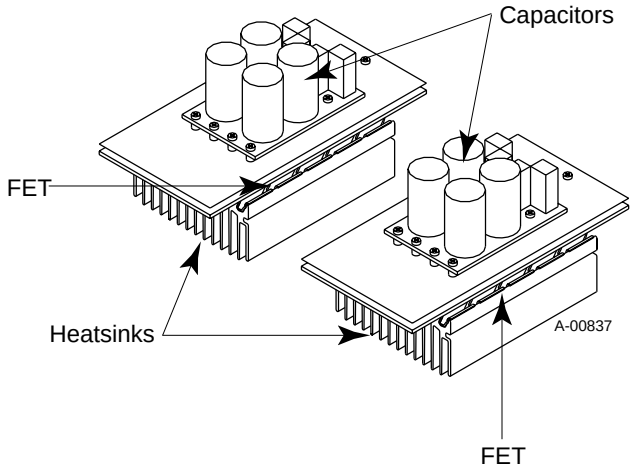


Figure 4-19 FET/Heatsink/Capacitor PC Board Assemblies

7. Remove the two Phillips head screws securing the brace to the internal mounting plate located between the two FET/Heatsink/Capacitor PC Board assemblies.
8. Align round notch in Logic PC Board mounting frame with edge of FET PC Board.
9. Lift the center of the two FET/Heatsink assemblies allowing the outside edges to rotate on the internal frame.
10. Remove the center brace from between the Heatsinks and lower center of the Heatsinks.
11. Carefully slide the complete assembly towards the center and lift straight up and out of the internal frame.
12. Remove the Ribbon Cable from the bottom of the FET PC Board.
13. Install the replacement FET/Heatsink/Capacitor PC Board Assembly by reversing the above steps.
14. To replace the Input Diode, see procedures in section 4.10 F.

NOTE

Refer to Section 3.14 for procedure to test Diode status.

H. Coolant Pressure Gauge Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Drain coolant.
3. Disconnect the Coolant Pressure Gauge Assembly from the fitting at the T-Connector mounted on the Pump Assembly.
4. Clean the old thread sealer from the threads of the T-Connector fitting.
5. Apply a thin coating of liquid Teflon thread sealer to the threads of the replacement Coolant Pressure Gauge fitting.
6. Install the replacement Coolant Pressure Gauge by reversing the above steps.

4.11 Front Panel Parts Replacement

This subsection describes the replacement of various parts located near the front panel. Refer to Figure 4-18, Front Panel Parts, for an exploded view of assemblies, or refer to Section 5, Parts Lists, for the part number and location of each part.

A. Gas Supply Hose Replacement (Source to Pressure Switches)

NOTE

This procedure applies to both Plasma and Shield Gas Supply Hoses. Note that the Shield Gas Supply Hose is identified in yellow.

1. Remove the Enclosure Cover per Section 4.04.
2. Turn Gas Regulators off.
3. Locate the Gas Supply Hose and T-Fitting, and disconnect the Supply Hose.
4. Remove the Supply Gas Hose through the hole in rear panel. If the hole size is too small, pinch the sides of the plastic hose guide connector on the rear panel and then pull it away from the panel.
5. Replace the Gas Supply Hose by reversing the above procedure.

B. Gas Hose Replacement (Solenoid to Q.D.)

NOTE

This procedure applies to both Plasma and Shield Gas Hoses.

1. Turn Gas Regulators off.
2. Remove the Enclosure Cover per Section 4.04.
3. Locate the Gas Hose and Solenoid. Pull the Hose from the Solenoid Fitting while pushing the fitting collar towards the fitting.
4. Remove the Hose from the Gas Fitting on the rear of the TORCH Connector by while pushing the collar fitting towards the fitting.
5. Replace the Gas Hose by reversing the above steps.

C. Gas Pressure Switch Replacement

NOTE

This procedure applies to both Plasma and Shield Gas Pressure Switches.

1. Remove the Enclosure Cover per Section 4.04.
2. Locate the Gas Pressure Switch and T-Fitting.
3. Label and remove the two wires from Gas Pressure Switch.
4. Remove the Gas Pressure Switch from the T-Fitting.
5. Install the replacement Gas Pressure Switch Assembly by reversing the above procedure.

D. Flow Meter or Solenoid Replacement

NOTE

BOTH Solenoid/Flow Meter Assemblies must be removed through the front panel of the unit in order to replace a Flow Meter or Solenoid Assembly for EITHER gas. The following steps describe this procedure. If detailed replacement instructions are required for a particular assembly, refer to the appropriate subsection above.

1. Turn Gas Regulators off.
2. Remove the Enclosure Cover per Section 4.04.
3. Disconnect the Plasma and Shield Gas Input Hoses from T-Fittings.
4. Label and remove the wires connected to the Plasma and Shield Gas Pressure Switches.
5. Remove the Plasma and Shield Gas Pressure Switches.
6. Remove the Plasma and Shield Gas T-Fittings from the bottom of the Plasma and Shield Gas Flow Meters.
7. Disconnect the Plasma and Shield Gas Output Hoses from Solenoid Fittings.
8. Label and remove the wires connected to the Plasma and Shield Gas Solenoid Fittings.
9. Remove the Plasma and Shield Gas Solenoid Fittings from the Solenoids.
10. Remove the two bottom screws securing the Flow Meters to the Front Panel.
11. Loosen the two top screws securing the Flow Meters to the Front Panel.
12. Pull the Solenoid assemblies/Flow Meters out the hole in the Front Panel by tilting the gauge out at the bottom until the Solenoids will feed through the hole.
13. Remove Solenoid Assembly from Gas Flow Meter assemblies by pushing out and dropping down so the Solenoid can be rotated out.

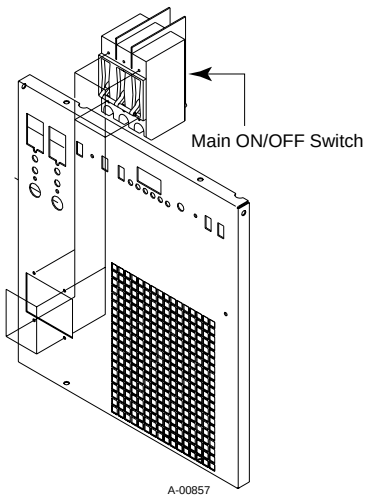
NOTE

In some cases a 1/8" NPT Close Nipple may be included as part of the Flow Meter replacement Assembly. If so, remove the old Close Nipple and install the new one as part of the Assembly.

14. Install the replacement Assembly by reversing the above procedure.

E. Main ON/OFF Switch Assembly Replacement

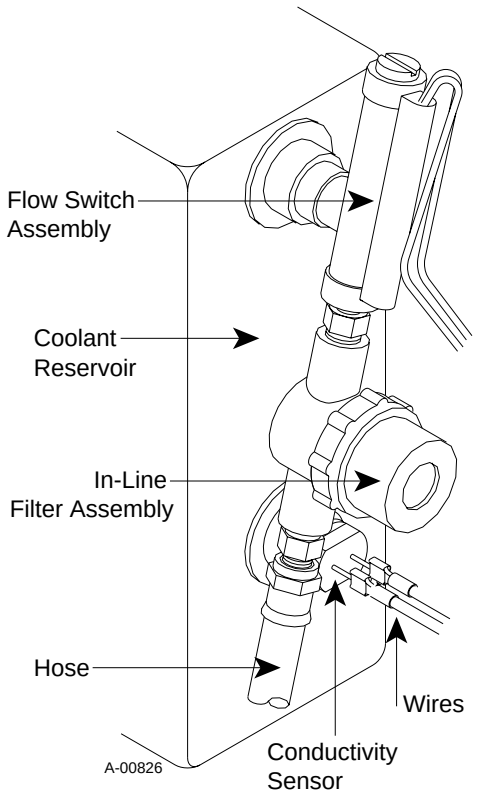
1. Remove the Enclosure Cover per Section 4.04.
2. Label each wire connected to the terminals of the Main ON/OFF Switch Assembly.
3. Remove all wiring from the Main ON/OFF Switch.
4. Remove four (4) screws securing Switch Assembly to the Front Panel and remove Switch Assembly
5. Install the replacement Main ON/OFF Switch Assembly by reversing the above procedure.



4-20 Main ON/OFF Switch Location

F. Coolant Temperature Switch Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Unclip the Coolant Temperature Switch from the side of the Radiator and pull out slightly from unit.
3. Cut off the existing Coolant Temperature Switch a few inches from the clip end.



4-21 Temperature Switch Assembly Location

4. Attach the new Coolant Temperature Switch wires (2) to the existing wires (2) using the closed end Pigtail Splices and a crimping tool.

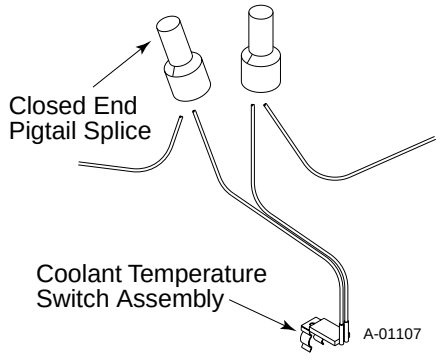


Figure 4-22 Coolant Temperature Switch Installation Detail

5. Connect the Coolant Temperature Switch clip to the side of the Radiator.
6. Replace Enclosure Cover.

4.12 Rear Panel Assembly Parts Replacement

A TORCH Connector Shield Gas Fitting Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Remove the Shield Gas Supply Hose (yellow) and Fitting from the rear of the Shield Gas Fitting.
3. Using a snap ring tool remove the Socket Retaining Ring Clip from the Shield Gas Fitting in the TORCH connector.
4. Pull the fitting out the back of the TORCH Quick Disconnect Connector.

NOTE

Be careful that the Canted Coil Spring inside the fitting does not fall out or get turned sideways.

5. Install the replacement Shield Gas Fitting by reversing the above steps.

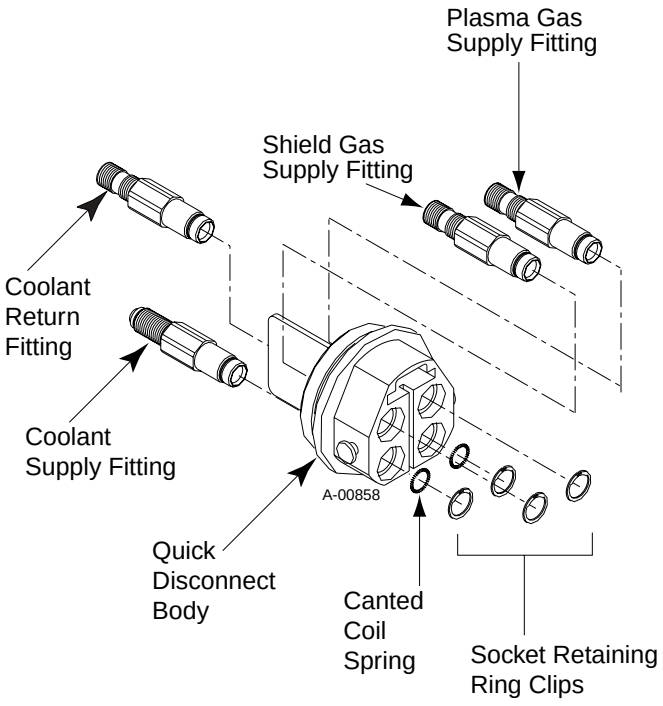


Figure 4-23 TORCH Disconnect Assembly Parts

B. TORCH Connector Plasma Gas Fitting Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Remove the Plasma Gas Supply Hose (black) and Fitting from the rear of the Plasma Gas Fitting.
3. Using a snap ring tool remove the Socket Retaining Ring Clip from the Plasma Gas Fitting in the TORCH connector.
4. Pull the fitting out the back of the TORCH Quick Disconnect Connector.

NOTE

Be careful that the Canted Coil Spring inside the fitting does not fall out or get turned sideways.

5. Install the replacement Plasma Gas Fitting by reversing the above steps.

C. TORCH Connector Coolant Supply Fitting Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Remove the Coolant Supply Hose (green) from the rear of the Coolant Supply Fitting.
3. On the TORCH connector remove the nut securing a wire ring and the Buss Bar to the fitting.
4. Using a snap ring tool remove the Socket Retaining Ring Clip from the Coolant Supply Fitting in the TORCH connector.
5. Pull the fitting out the back of the TORCH Quick Disconnect Connector.

NOTE

Be careful that the Canted Coil Spring inside the fitting does not fall out or get turned sideways.

6. Install the replacement Coolant Supply Fitting by reversing the above steps.

D. TORCH Connector Coolant Return Fitting Replacement

1. Remove the Enclosure Cover per Section 4.04.
2. Disconnect the Coolant Return Hose (red) Assembly from the Check Valve connected to the Coolant Return Fitting.
3. Remove the Check Valve from the Coolant Return Fitting in the TORCH Quick Disconnect Connector.
4. On the TORCH connector remove the nut securing a wire ring to the fitting.
5. Using a snap ring tool remove the Socket Retaining Ring Clip from the Coolant Return Fitting in the TORCH connector.
6. Pull the fitting out the back of the TORCH Quick Disconnect Connector.

NOTE

Be careful that the Canted Coil Spring inside the fitting does not fall out or get turned sideways.

7. Install the replacement Coolant Return Fitting by reversing the above steps.

F. Standard Remote Wire Assembly Replacement

The ULTIMA-150 is supplied with a Remote Wire Assembly installed. The Remote Wire Assemblies are replaced in the same manner.

1. Remove the Enclosure Cover per Section 4.04.
2. Locate TB1 on the Logic/Display PC Board and label the wires installed from the Remote Wire Assembly.
3. Disconnect the Remote Wire Assembly wires from the connections at TB1.
4. Remove the two screws securing the Remote Wire Assembly Connector to the rear panel.
5. Pull the Remote Wire Assembly from the Rear Panel.
6. Install the replacement Remote Wire Assembly by reversing the above steps.

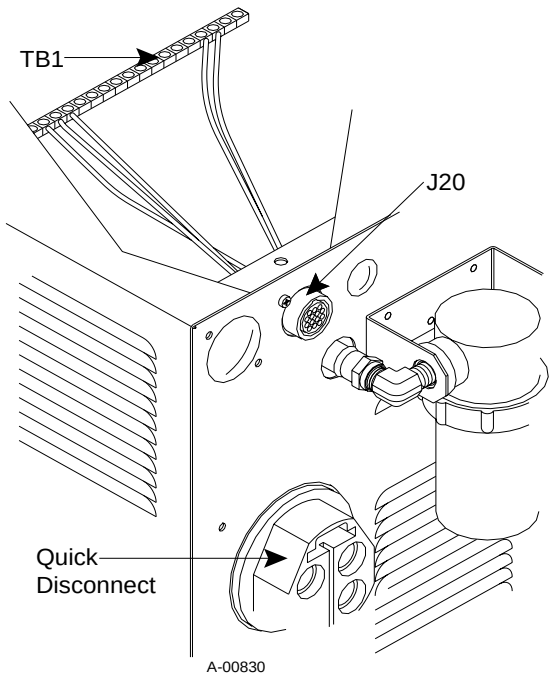


Figure 4-24 Remote Wire Assembly Location

SECTION 5: PARTS LISTS

5.01 Introduction

A. Parts List Breakdown

The parts list provides a breakdown of all replaceable components. Control modules are field serviceable, so a complete breakdown of parts is provided. Power modules must be returned to an authorized Thermal Arc distributor for service. The parts lists are arranged as follows:

Section 5.03: Front Panel Replacement Parts

Section 5.04: Center Chassis Replacement Parts

Section 5.05: Base Unit Replacement Parts

Section 5.06: Rear Panel Replacement Parts

NOTE

Parts listed without item numbers are not illustrated, but may be ordered by the catalog numbers shown.

B. Returns

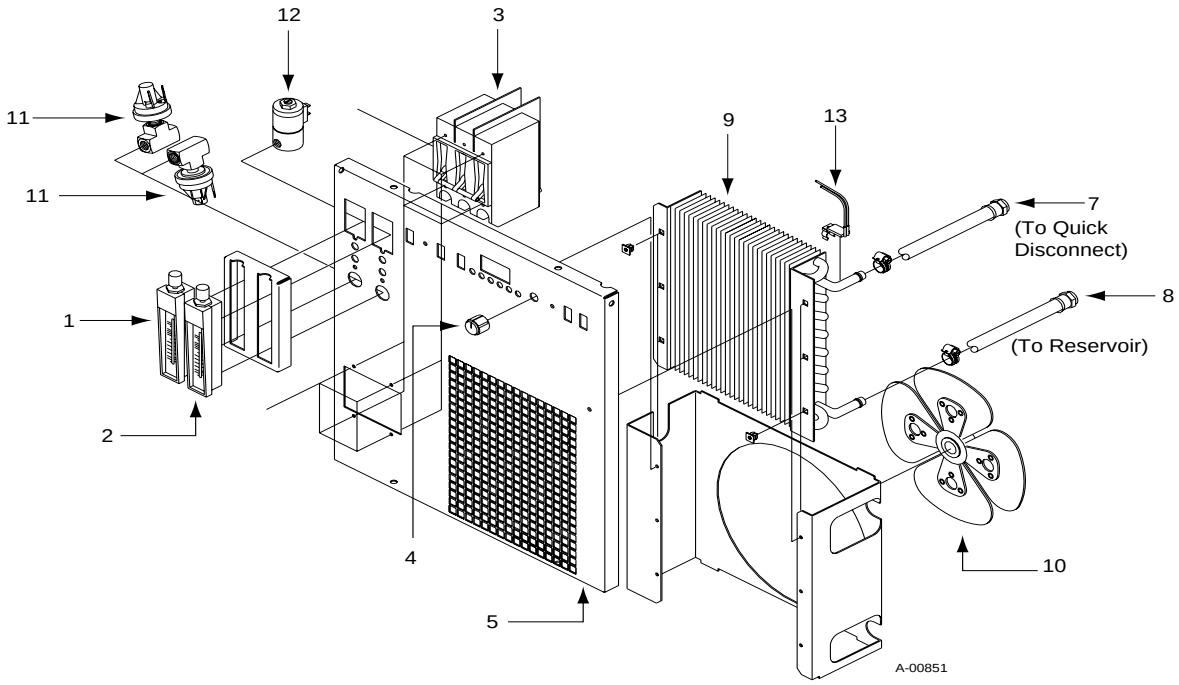
If a product must be returned for service, contact your distributor. Materials returned without proper authorization will not be accepted.

5.02 Ordering Information

Order replacement parts by catalog number and complete description of the part or assembly, as listed in the description column of the Parts List. Also include the model and serial number of the machine as shown on the plate attached to the front panel of the unit. Address all inquiries to your authorizeddistributor.

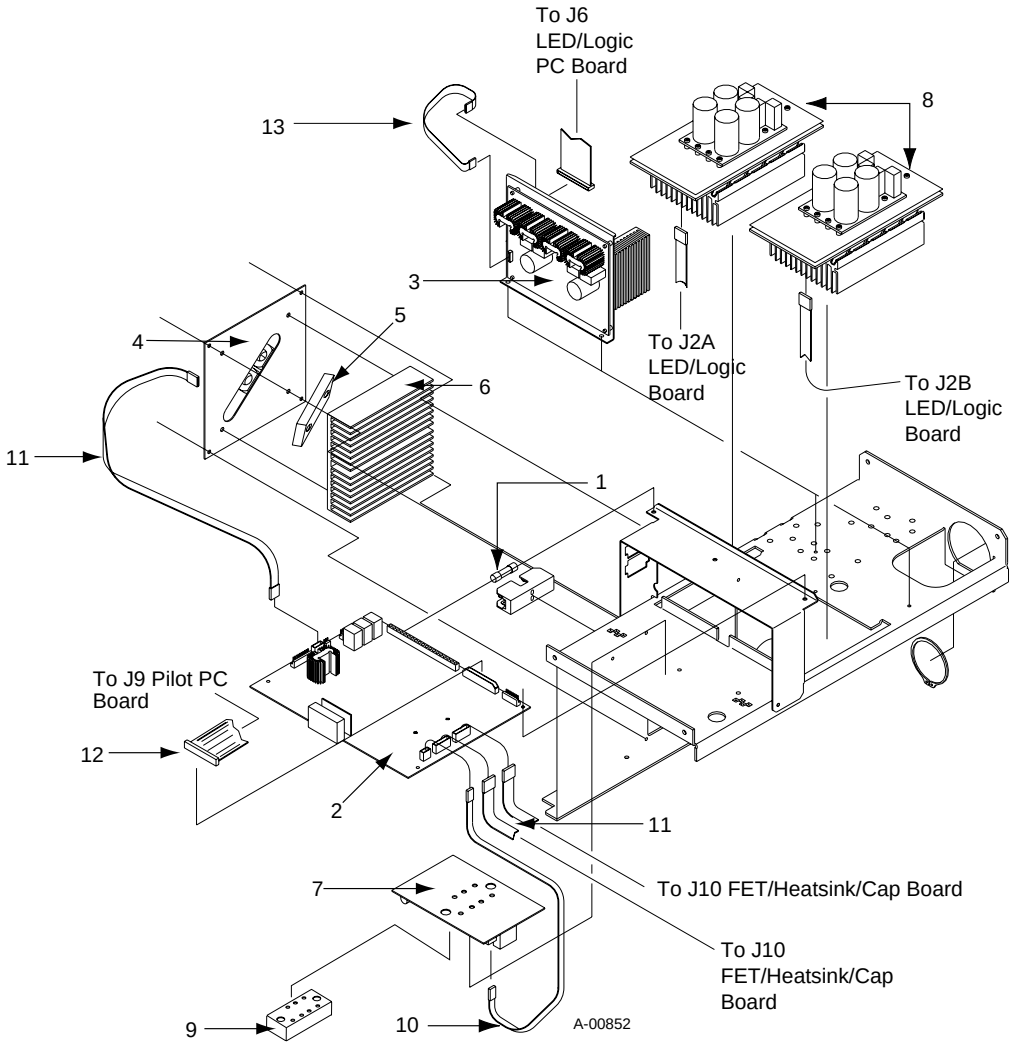
5.03 Front Panel Replacement Parts

Item #	Qty	Description	Cat #
1	1	Shield Gas Flowmeter	9-5919
2	1	Plasma Gas Flowmeter	5-2997
3	1	On/Off Switch	9-5940
4	1	Current Control Knob	9-4146
5	1	Front Panel Assembly	9-5945
6	1	Cover (Not Shown)	9-5947
7	1	Hose (Radiator To Reservoir)	9-5929
8	1	Hose (Disconnect To Radiator)	9-5928
9	1	Radiator (Includes 6 Grommets)	9-5941
10	1	Fan	9-5944
11	2	Gas Pressure Switch	9-4073
12	2	Gas Solenoid Valve	8-3370
13	1	Coolant Temperature Switch Assembly	9-5967



5.04 Center Chassis Replacement Parts

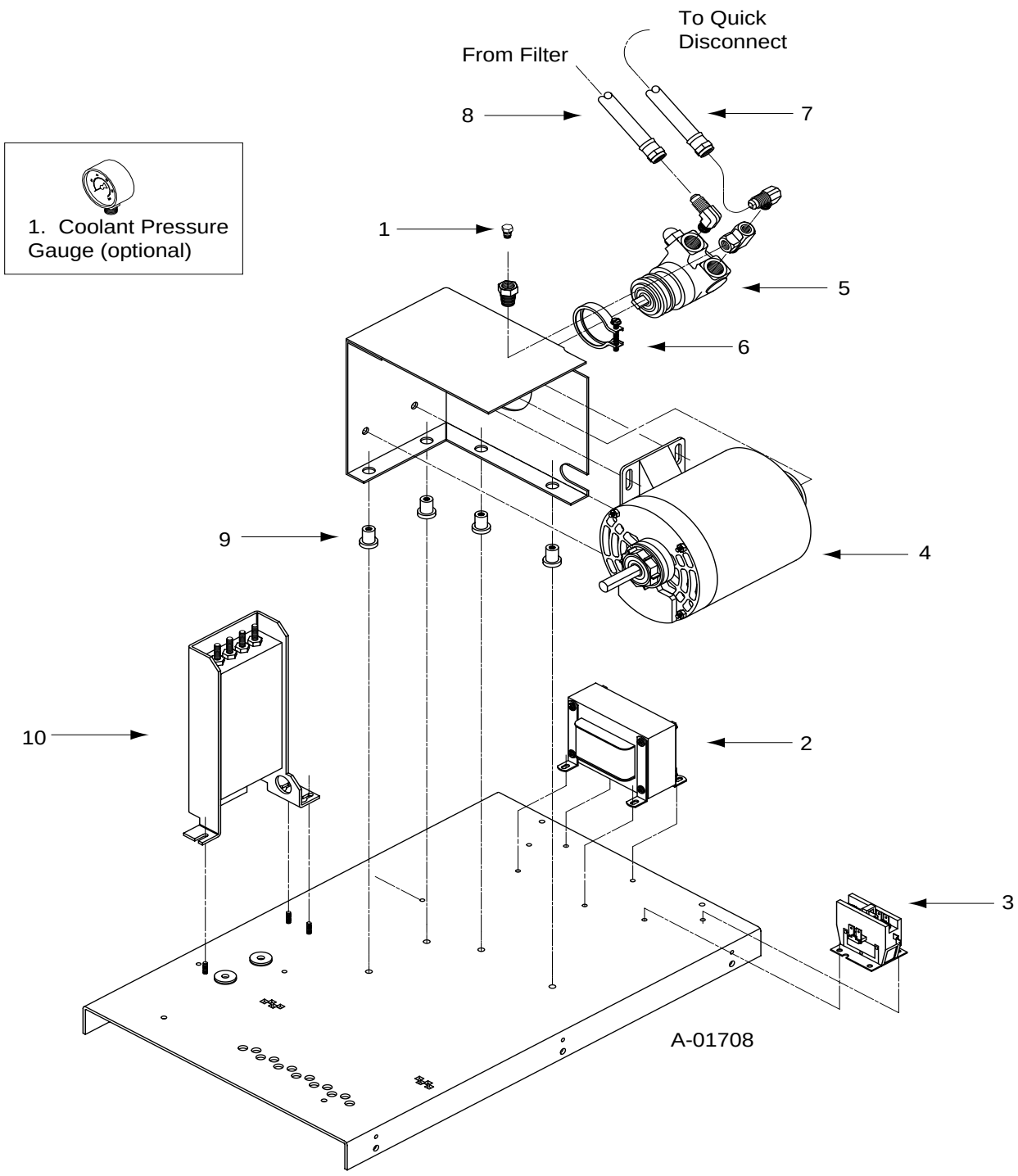
Item #	Qty	Description	Cat #
1	1	Fuse (3 Amp, 500V)	8-1153
2	1	Logic/Display PC Board Assembly	9-5934
3	1	Pilot PC Board Assembly	9-5933
	1	Output PCB/Diode Bridge/Heatsink Assembly (Includes #4-6)	9-5973
4	1	Output PC Board Assembly	9-5936
5	1	Diode Bridge Assembly With Thermal Pad	9-5974
6	1	Heatsink	
	1	FET PCB/Heatsink/Capacitor/PC Board Assembly (Includes #7-9)	9-5975
7	1	Input PC Board Assembly	9-5935
8	2	FET/Cap/Heatsink Assembly	9-5953
9	1	Diode, 3 Phase W/Scr, 40A, 1600V With Thermal Pad	9-5950
10	2	Cable Assembly (5 Cir Ribbon, 18" Long)	9-5923
11	2	Cable Assembly (10 Cir Ribbon, 15" Long)	9-5922
12	1	Cable Assembly (34 Cir Ribbon, 14" Long)	9-5924
13	1	Current Sense Ribbon Cable	9-4463



5.05 Base Unit Replacement Parts

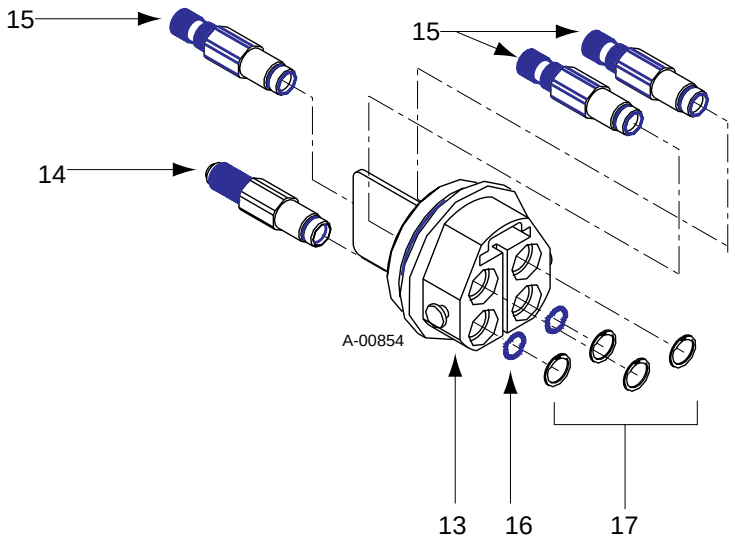
Item #	Qty	Description	Cat #
1	1	Coolant Pressure Gauge (Optional)	9-6220
1	1	Pressure Gauge Plug	9-4583
2	1	Auxiliary Transformer	9-5921
3	1	Contactor	9-5920
4	1	Motor	9-5932a
5	1	Pump	9-6164
6	1	Pump Clamp	9-5942
7	1	Hose (Pump To Disconnect)	9-5927
8	1	Hose (Filter To Pump)	9-5926
9	4	Vibration Isolation Mount	9-5943
10	1	Input Filter Assembly	9-5976

5.05 Base Unit Replacement Parts



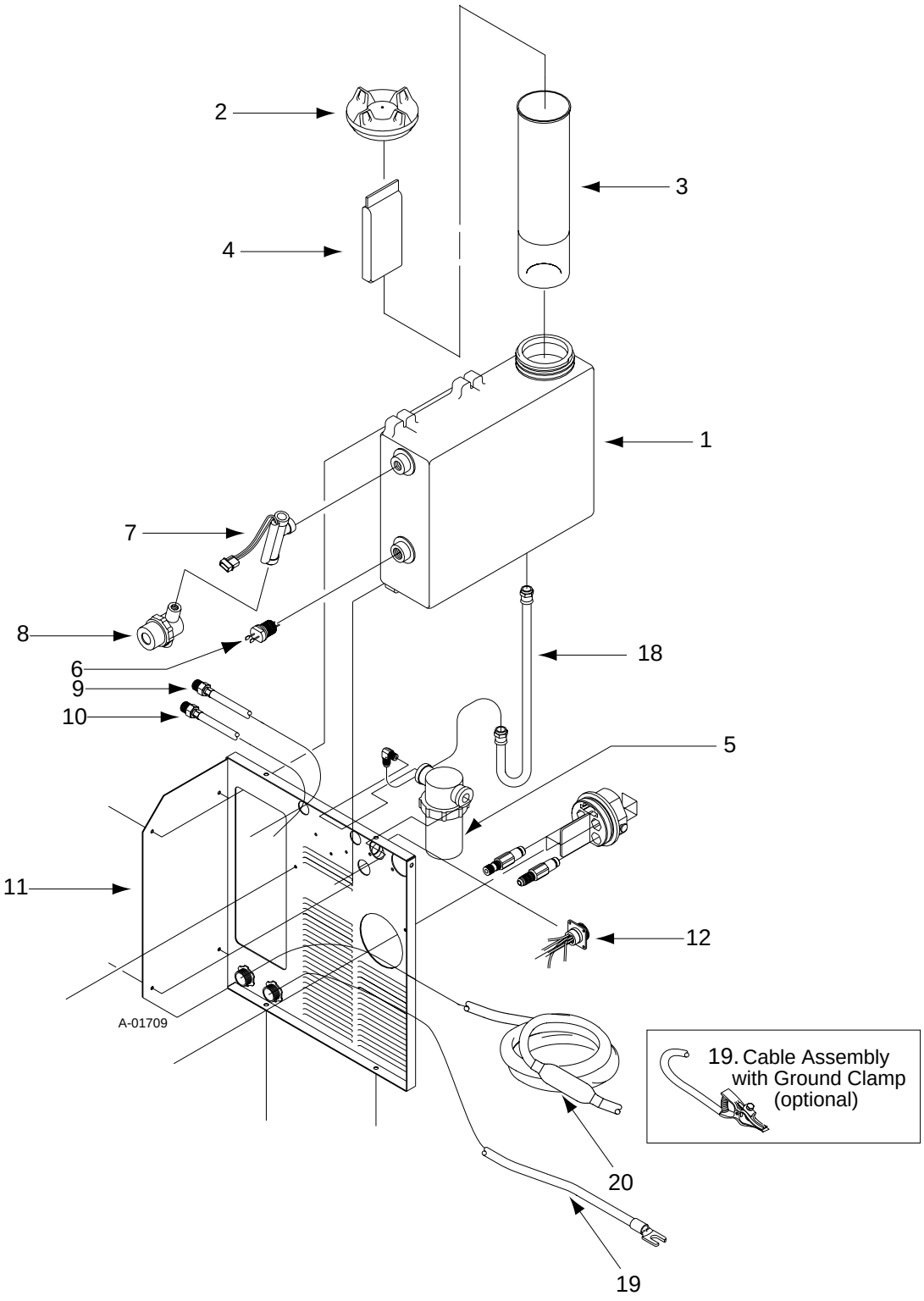
5.06 Rear Panel Replacement Parts

Item #	Qty	Description	Cat #
1	1	Coolant Reservoir Assembly	9-5948
2	1	Coolant Reservoir Cap	8-5142
3	1	Deionizer Basket	8-4410
4	1	Deionizer Bag	8-3312
5	1	Coolant Filter	8-4276
6	1	Conductivity Sensor Assembly	8-6203
7	1	Flow Switch Assembly	9-5937
8	1	In-Line Filter	8-3460
9	1	Shield Supply Hose	9-5931
10	1	Plasma Supply Hose	9-5930
11	1	Rear Panel Assembly	9-5946
12	1	Standard Remote Assembly (N/A)	9-5951
13*	1	Quick Disconnect Body Assembly	9-5917
14*	1	Quick Disconnect Fitting (Female)	9-5939
15*	3	Quick Disconnect Fitting,	9-5938
16*	2	Canted Coil Spring	9-4492
17*	4	Retaining Ring	9-4488
18	1	Hose (Reservoir To Filter)	9-5925
19	1	Cable Assembly With Cable Lug	9-5949
19	1	GC-200 Ground Clamp (Optional)	9-2628
20	1	EMC Input Cable Assembly	9-5977



*Quick Disconnect Body Assembly Parts

5.06 Rear Panel Replacement Parts

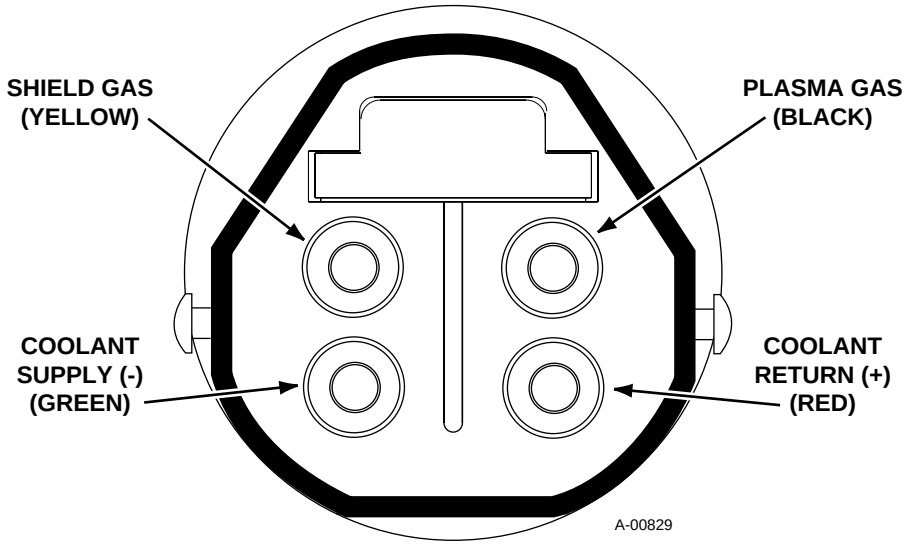


APPENDIX I: EYE PROTECTION CHART

Welding or Cutting Operation	Electrode Size Metal Thickness or Welding Current	Filter Shade Number
Torch soldering	-	2
Torch brazing	-	3 or 4
Oxygen Cutting		
Light	Under 1 in (25 mm)	3 or 4
Medium	1-6 in (25-150 mm)	4 or 5
Heavy	Over 6 in (150 mm)	5 or 6
Gas welding		
Light	Under 1/8 in (3 mm)	4 or 5
Medium	1/8-1/2 in (3-12 mm)	5 or 6
Heavy	Over 1/2 in (12 mm)	6 or 8
Shielded metal arc welding (stick) electrodes		
Light	Under 5/32 in (4 mm)	10
Medium	5/32-1/4 in (4-6.4 mm)	12
Heavy	Over 1/4 in (6.4 mm)	14
Gas metal arc welding (MIG)		
Non-ferrous base metal	All	11
Ferrous base metal	All	12
Gas tungsten arc welding (TIG)	All	12
Atomic hydrogen welding	All	12
Carbon arc welding	All	12
Plasma arc welding	All	12
Carbon arc air gouging		
Light	-	12
Heavy	-	14
Plasma arc cutting		
Light	Under 300 amps	9
Medium	300-400 amps	12
Heavy	Over 400 amps	14

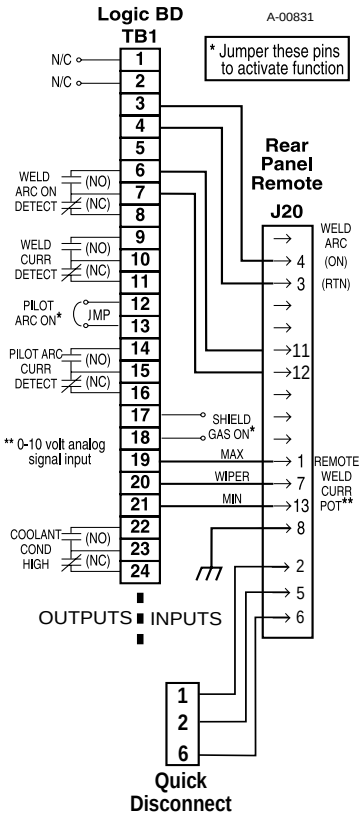
Recommended Eye Protection for Welding and Cutting (Based on AWS A6.2-73)

APPENDIX II: QUICK DISCONNECT LEADS ASSIGNMENT



Rear Panel Mounted Quick Disconnect Leads Assignment
Viewed Looking at Rear Panel

APPENDIX III: REMOTE WIRING



Notes:

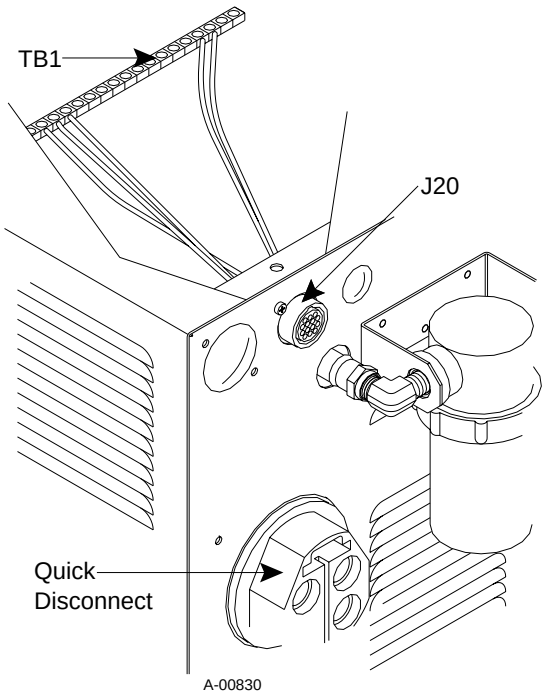
1. Welding Arc/ON disabled without closing TB1-3 to TB1-4. This must be done by direct interface to TB1-3 & TB1-4 or via remote connection J20 Pin 3 to 4.
2. To disable the pilot arc when coolant conductivity level is high, connect pin 12 to pin 24 and pin 13 to pin 23.
3. Weld Arc On Detect (for use with Synerweld 2100) is enabled with the following wiring connections*:

   • TB1-6 to J20 pin 11

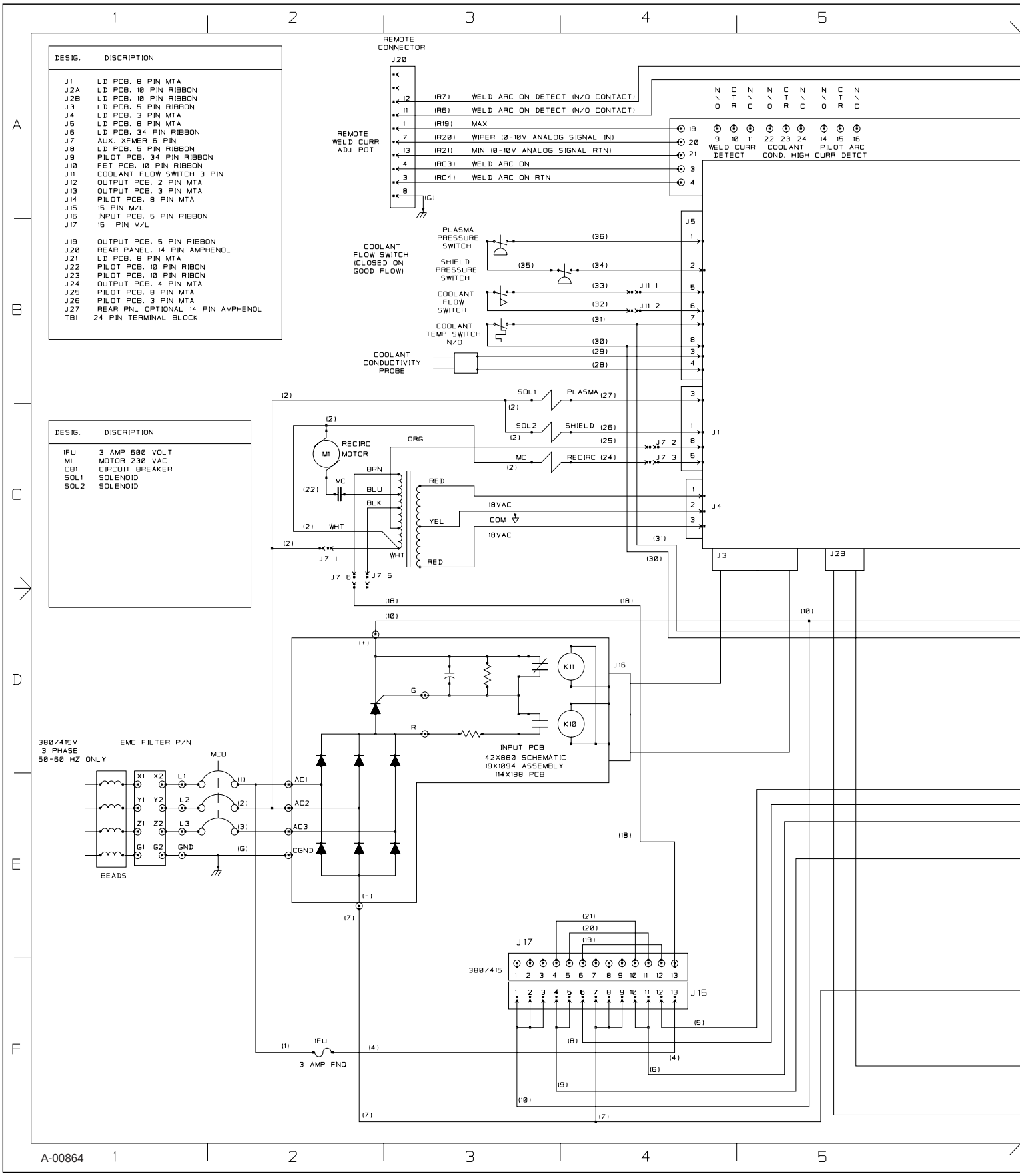
   • TB1-7 to J20 pin 12

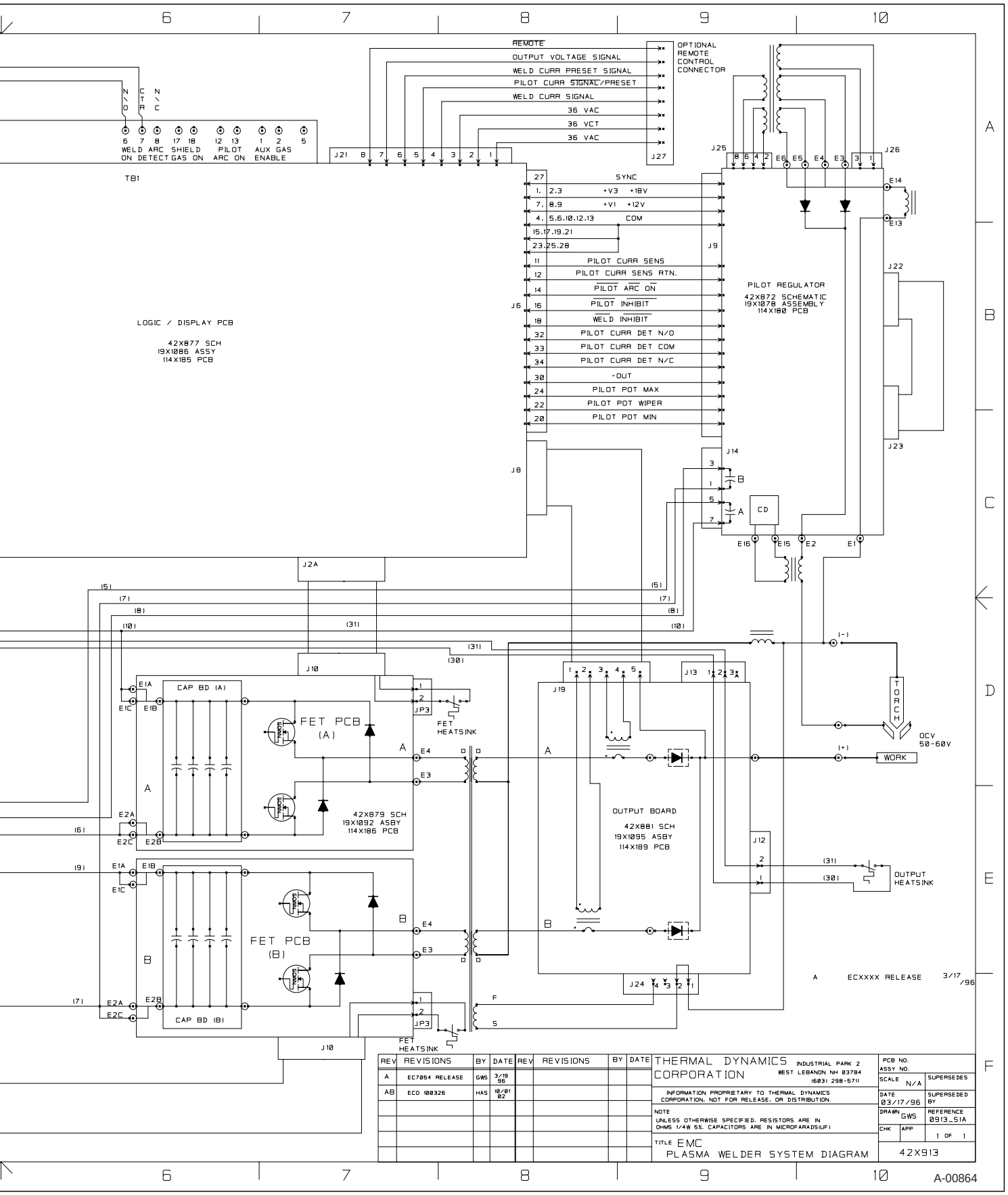
   (If not using J20, wire directly from input/output interface signals to TB1.)

   * Ultima units manufactured after Nov. 1997 are factory-wired; all other units must be wired by user.
4. Wiring Connections for the 3A Torch with Auto Wire Feed are through J20 to Quick Disconnect.



APPENDIX IV: SYSTEM SCHEMATIC




REMOTE
OUTPUT VOLTAGE SIGNAL
WELD CURR PRESET SIGNAL
PILOT CURR SIGNAL/PRESET
WELD CURR SIGNAL
36 VAC
36 VCT
36 VAC
OPTIONAL REMOTE CONTROL CONNECTOR
J27
J21
N/O
CTR
N/C
6 WELD ON
7 ARC DETECT
8 SHIELD GAS ON
17 18
12 13 PILOT ARC ON
1 2 AUX GAS ENABLE
5
TB1
LOGIC / DISPLAY PCB
42X877 SCH
19X1086 ASSY
114X185 PCB
SYNC
+V3 +18V
+V1 +12V
COM
PILOT CURR SENS
PILOT CURR SENS RTN.
PILOT ARC ON
PILOT INHIBIT
WELD INHIBIT
PILOT CURR DET N/O
PILOT CURR DET COM
PILOT CURR DET N/C
-OUT
PILOT POT MAX
PILOT POT WIPER
PILOT POT MIN
J6
J8
J9
J25
J26
J22
J23
J14
PILOT REGULATOR
42X872 SCHEMATIC
19X1078 ASSEMBLY
114X180 PCB
CD
E1
E2
E13
E14
E15
E16
J2A
J10
CAP BD (A)
CAP BD (B)
FET PCB (A)
FET PCB (B)
FET HEATSINK
JP3
42X879 SCH
19X1092 ASBY
114X186 PCB
J19
J13
J12
J24
OUTPUT BOARD
42X881 SCH
19X1095 ASBY
114X189 PCB
OUTPUT HEATSINK
TORCH
OCV 50-60V
WORK
A ECXXXX RELEASE 3/17/96
REV REVISIONS BY DATE
A EC7054 RELEASE GWS 3/19/96
AB ECO 100326 HAS 10/01/02
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NOTE
UNLESS OTHERWISE SPECIFIED. RESISTORS ARE IN OHMS 1/4W 5%. CAPACITORS ARE IN MICROFARADS(UF)
TITLE EMC
PLASMA WELDER SYSTEM DIAGRAM
PCB NO.
ASSY NO.
SCALE N/A
SUPERSEDES
DATE 03/17/96
SUPERSEDED BY
DRAWN GWS
REFERENCE 0913_51A
CHK APP
1 OF 1
42X913
A-00864

APPENDIX V: HOSE DIAGRAM